REPORT ON THE U. S. PHARMACOPŒIA.

NOTE ON RHUBARB,

FOR 1869.

NOTE ON COLLODION,

BY F. C. MUSSGILLER.

LIQUOR OPII COMPOSITUS.

BY

EDWARD R. SQUIBB, M. D.,

OF BROOKLYN, N. Y.

Republished from the Proceedings of the Amer. Pharm. Association for 1869, and from the Amer. Journ. of Pharmacy for January, 1870.

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PREFACE.

The papers here presented together are republished, the first three from the Proceedings of the American Pharmaceutical Association for 1869, and the fourth from the American Journal of Pharmacy for January, 1870.

In the discussion which followed the reading of the Report on the U. S. Pharmacopœia before the Association, objections were made to the extent and character of the changes recommended in the Report. Although these objections were not general, nor the objectors sufficiently numerous to express the sense of the Association, yet as the principal objections came from Prof. Procter, who was a member of the Committee on the Pharmacopœia, and whose judgment is entitled to great respect, the writer offered the following resolution to accompany the Report when published, and the resolution was adopted:

Moved by Dr. Squibb, that in the reference of his report on the Pharmacopœia to the Executive Committee for publication in the Proceedings, the report be prefaced by the distinct statement that the Association, in publishing this report, does not endorse the judgment of the reporter in his recommendation to dismiss so many articles.

The Note on Rhubarb for 1869 will be best understood when read in continuation of a similar note which was published in the Proceedings of the American Pharmaceutical Association for 1868, at page 452.

The Note on Collodion, by Mr. Mussgiller, was prepared in the laboratory of the writer, the experiments being conducted with care and accuracy by Mr. Mussgiller, under the writer's direction and supervision. As, however, he—Mr. M.—considered his knowledge of the English language insufficient, the text of the paper was written by this writer, and it is therefore republished here as a joint product.

The paper on Liquor Opii Compositus is republished from the American Journal of Pharmacy for January, 1870, and is a continuation or sequel to a paper on the same subject by the same author, published in that Journal for March, 1860, at page 115.

These papers are republished together for gratuitous distribution, chiefly to the Medical Corps of the United States Army and Navy; and they are presented to the Surgeon General's Office, U. S. A., and to the Bureau of Medicine and Surgery, U. S. N., with great respect.

E. R. Squibb.

Brooklyn, Jan. 6, 1870.

REPORT OF THE COMMITTEE ON THE PHARMACOPŒIA.

BY EDWARD R. SQUIBB, M.D., CHAIRMAN.

At the Eleventh Annual Meeting of the Association, held in Boston, in Sept., 1863, the following preamble and resolution were adopted:

"*Whereas*, it is desirable that during the interval between the decennial revisions of the Pharmacopœia there may be some repository in this Association for the information and knowledge resulting from prolonged practical use of the officinal formulas; and some members whose particular duty it may be to observe during this interval what additions or omissions might be usefully made in the next ensuing revision, therefore,

Resolved, That a permanent Committee on the Pharmacopœia, to consist of three members, be appointed to keep a current commentary upon the Pharmacopœia, and a record of all useful criticisms and suggestions that may be made upon it while in practical use, with a direct view to its future revision; and that the Chairman of this Committee may, at his option, report an abstract of such information as he may gain, at the annual meetings of the Association. And, finally, that members generally be requested to communicate to the Chairman any information or suggestions bearing upon the duties of the Committee."

In pursuance of this resolution the President appointed E. R. Squibb, Wm. Procter, Jr., and Alfred B. Taylor to constitute this Committee. See Proc. Amer. Pharm. Asso. for 1863, pp. 42, et seq.

At the Thirteenth Annual Meeting, held in Boston in 1865, the Chairman offered a paper upon economy in alcohol, as applied to the extracts and fluid extracts of the Pharmacopœia, which is published in the Proceedings of that year, at pp. 201 et seq.

At the Fourteenth Annual Meeting, held at Detroit in 1866, your reporter offered, in continuation, a critical report on the officinal process for fluid extract of buchu, which is published in the Proceedings of that year at pp. 81 et seq.

At the Fifteenth Annual Meeting, held in New York in 1867, your reporter offered another paper in continuation, upon repercolation as a means of economizing alcohol in the exhaustion of drugs, which is published in the Proceedings of that year at pp. 391 et seq.

At the Sixteenth Annual Meeting, held in Philadelphia in 1868, the Chairman made a report on behalf of the Committee, which is published in the Proceedings of 1868 at pp. 25 and 26. In this report it was suggested, and the suggestion was adopted by the Association, that at this meeting each member of this Committee should present a simple critical review of the Pharmacopœia in the light of his past experience, each making mere points of approval or objection as his experience and judgment might indicate.

It now, therefore, becomes the duty of your reporter, on his own behalf, to offer the following review of the Pharmacopœia, based upon his own practice and judgment. To give the reasons and arguments for the changes suggested would involve too much time and labor, and would extend this report beyond proper limits. The utmost that can be undertaken is to give some prominent reason or argument, whenever this can be done in very few words.

The first suggestion to be made is whether a revision, or at least a partial revision, of the Pharmacopœia should not be made at shorter intervals than ten years. Good reasons are so numerous on both sides of this question that it may be difficult to decide it aright, but your reporter inclines to the belief that at least a partial revision should be more frequently made.

The time is approaching, if not now come, when it will be wise to provide for the expenses incident to the revision of the Pharmacopœia. It would be comparatively easy to defray the expenses of the Conventions by assessment upon the bodies represented in it. But the much heavier expenses of the Committee of Final Revision and Publication are not so easily met. If, as in the past, the members of that committee who are relied on to perform the labor are named from one locality, there is danger that the Pharmacopœia may be unduly local in its character and influence; whilst if members go from a distance to attend these meetings, the loss of time and the expense are too great to be contributed by those best qualified to do the duty. The authors of any copyright Commentary upon the Pharmacopœia are the only persons who get any adequate compensation for their labors in connection with it, and such need not necessarily serve in the committee at all. In regard to the future of the Pharmacopœia this subject deserves earnest attention.

It is suggested that the general principles and plan, and some of the leading special points in the construction and management of the Pharmacopœia should be more freely discussed and determined by the Convention itself, and that an accurate phonographic report of the proceedings of the Convention be taken and published.

The preliminary notices of the Pharmacopœia might, in the judgment of your reporter, be extended with utility.

The division of the Materia Medica into a primary and secondary list is, to say the least, of doubtful utility. And if it be not useful it is an unnecessary complication.

The class of preparations contains many articles that should be transferred to the Materia Medica.

The tables of the Pharmacopœia could be increased in number with great utility, so as to include tables of doses, of poisons and antidotes, of reagents and their prominent reactions, of solubilities, etc., unless it should be thought better to give this kind of information where it can be done more perfectly, that is, in connection with the substances, in the body of the work.

The first heading or division of the Pharmacopœia is "Preliminary Notices," and the first sub-heading or sub-division is

"Weights and Measures." It is suggested that the tables of avoirdupois weights, of imperial measures, and of the metrical system of weights and measures, with compound tables showing the relative value of the various denominations of each one in every other, be added here, and that care should be taken to give that prominence to the metrical system which is due to it as the best of all, and as that which is rapidly advancing toward universal application.

A more mature consideration of the subject has confirmed your reporter in the opinion, strongly advocated ten years ago, that it would be wise and proper to discard measures entirely from the usage of the Pharmacopœia, substituting weights throughout. And then, either for permanency, or as a transition stage towards the adoption of the metrical system, to use the method of expressing quantities in parts by weight; or, expressing the proportional relation of ingredients rather than arbitrary quantities, leaving it to the choice or need, or other circumstances of the operation, to determine not only the kind of weights to be used, but also the scale upon which the operation is to be performed. Take the present formula for Compound Fluid Extract of Sarsaparilla, as being about as complex an example as could be selected.

Take of Sarsaparilla, in moderately fine powder, sixteen troyounces.	64 parts.
Liquorice Root, in moderately fine powder,	
Bark of Sassafrass Root, in moderately fine powder, each two troyounces.	8 parts.
Mezereon, in moderately fine powder, three hundred and sixty grains.	3 parts.
Sugar, twelve troyounces.	48 parts.
Diluted Alcohol a sufficient quantity.	

Mix the powders, and having moistened the mixture with ten fluidounces, 36·166 parts of diluted alcohol, pack it firmly in a cylindrical percolator, and gradually pour upon it diluted alcohol until four pints, 236·8 parts of tincture have been obtained. Evaporate this by means of a water bath to twelve fluidounces, 48 parts; then add the sugar, and continue the evaporation until

the liquid is reduced to the measure of eighteen fluidounces, and strain while hot; or, to the weight of 81·424 parts, and strain while hot.

The fractions of parts are stated merely to be accurately equivalent, and of course would be omitted in constructing formulas in parts; and the terms of the formulas would be simplified. If this formula was thus given in parts, the person proposing to use it would, according to his circumstances, translate the term part into a quarter of a troyounce, which would be the scale of the Pharmacopœia; or into a quarter of an avoirdupois ounce, which would be about 10 per cent. less; or into an ounce or a pound, or an hundred pounds of either table of weights, and so long as he adhered to the same table throughout, the resulting preparation would always be the same. For the purposes of the Pharmacopœia, it would be better to make the successive proportional quantities 22, 3, 1, 19, 12, 80, 12, and 28 parts, instead of the numbers given, and then the pharmacist, by translating the part into an ounce of whichever table of weights he might possess, would obtain a product about one-third greater. The good reasons for and against this method of stating the formulas was so thoroughly discussed ten years ago, by the writer and others, that it is not necessary to go over the ground again now. The method was then comparatively new and untried. The last revision of the Prussian Pharmacopœia is now an excellent example of it, and well illustrates all its advantages and disadvantages. And when that work is compared with the French Codex, wherein the metrical system is used, it appears to fall little short of this in practical utility. Dorvault, in "L'Officine," regards the two methods as practically almost identical, and it remains to be seen whether the pharmacy of this country is to advance toward the adoption of these progressive steps in knowledge, or wait to be dragged into them by the common currents of events. When two such nations as Great Britain and the United States fail to lend a helping hand, or set themselves in opposition to an advancement long acknowledged and slowly becoming general, their influence is very great, but not irresistible.

Under the subdivision on "Temperature," it is suggested that both Fahrenheit and centigrade degrees be given; and that temperatures be stated in degrees when required, rather than by such terms as "gentle heat." This latter expression is arbitrarily defined to mean any temperature between 90° and 100°. But such expressions as "moderate heat," used at pages 297 and 394, and "regulated heat" at pages 292 and 295, and possibly elsewhere, are not defined.

"SPECIFIC GRAVITY."

The temperature of 60° for specific quantities, is an inconvenient one for pharmaceutical use, and the time and trouble necessary to attain it, often, if not generally, obstructs the practice of this important test of strength and quality. As it is much easier to warm a liquid by applying the warmth of the hand to the vessel containing it than to cool it, it is suggested that specific gravities be given both at 60°=16° C. and at 77°=25° C. This would render it easy to get at intervening temperatures, and would facilitate the practice much, and would be better than the limited table given in the Prussian Pharmacopœia. A specific gravity bottle is shown herewith, by which absolute, not apparent, specific gravities are taken at all usual temperatures from 32° F. =0° C. to 77° F.=25° C.*

* These specific gravity bottles, of which one of the largest is shown, vary in size from about 100 c.c. to 1000 c.c., the larger giving, of course, the more accurate determinations, because the errors are so diminished. They are ordinary bottles of good shape, selected, first, with regard to the age, to avoid the error of change in capacity by contraction of the glass; and second, with regard to perfection and uniform strength and thickness of glass without unnecessary weight. The bottoms are so ground off on one side that the bottles may stand inclined, and thus prevent the large tube of the stopper from touching the scale beam or wires. A hollow stopper is made to project into the bottle, say half an inch, and on to the top of this is joined a glass tube about 12 centimetres long, with straight or slightly tapering bore of say 3 millimetres diameter at the lower end, and 4 millimetres at the upper end. On to the upper end is joined a piece of a large tube about 9 or 10 centimetres long, and 1 centimetre in diameter, into the upper end of which is ground a small glass stopper. The large hollow compound stopper thus constructed is accurately ground into the bottle by repeated regrinding and trial, until when the whole apparatus

"SATURATION."

It appears unnecessary now to direct how the point of saturation is to be determined, since the degree of ignorance upon which such a direction is predicated is incompatible with the use of a Pharmacopœia, and would be hopelessly puzzled by the acid and alkaline reactions of many saturated salts. Beside this, it is an inaccurate test in many cases, and in some crystallizations will cause failure.

is filled with common ether, the loss in weight on standing is reduced to a uniform rate of about ·03 gram. per hour. The loss with distilled water will then be imperceptible. By a hole drilled in the lower margin of the stopper, a short thermometer, graduated from 0° to 30° C., is suspended by a platina wire. The circumference of the small tube of the stopper is ruled into three columns for graduation. The bottle is filled with distilled water at its maximum density, till the water stands at the lower end of the narrow tube, at which point the graduation commences in the first of the three columns. The bottle and the water are then warmed in a bath 1° at a time, and the marks made for graduation. The first column serves to go up to say 16°. The bottle and contents are then carefully weighed and the tare subtracted, to obtain the first divisor, and this weighing is of course repeated every time the quantity of water in the bottle is diminished, in order to obtain a new divisor. Then a little of the water is removed from the tube by narrow strips of paper, until, while at the same temperature, the level of the surface, or rather the lower limb of the meniscus is on a horizontal level with the starting point of maximum density. This is marked 16° at the lower end of the second column for graduation, and is the starting point for that column of the scale. The bottle and contents are again warmed by immersion in a bath degree by degree, and marked as before, until this second column is completed. More water is removed from the tube at this temperature, as before, and the third column is graduated in the same way. We then have a divisor for each column, just as though there were three bottles of different capacity, one column adapted to each. This makes a convenient and comprehensive bottle, well adapted to very accurate determinations; for when used on a scale sensible to ·01 gram. the weighing error is removed to the fifth or sixth decimal place, according to the size of the bottle. The present means of determining specific gravities in common use, are not sufficiently accurate for the present state of knowledge, and in a paper now in course of preparation, the writer hopes to show that we must begin to avoid some of the inaccuracies, both of observation and expression, particularly in the s. g. of liquids. The writer has already gone far enough to show that the classical and commonly accepted observations of Drinkwater for absolute alcohol are probably considerably erroneous.

"STOPPAGE OF BOTTLES."

It is quite as easy, and is less liable to be misconstrued, to direct that bottles are to be glass stoppered when this is necessary, as to direct them to be "well stopped" in the text, and to define in the preliminary notices that this means that they must be closed with glass stoppers.

"PERCOLATION."

The process of percolation differs materially with every drug to which it is applied, and with every menstruum used, and ten years of experience upon every scale has very much modified your reporter's judgment, if it has not increased his knowledge upon the subject. And it is now doubted whether any general or typical directions can be given which will be usefully and safely applicable to any considerable class of medicinal substances. A general explanation of the principles of the process, and of the apparatus and appliances which up to this time have been found most effective and convenient in practice, are necessary to the Pharmacopœia, but the most successful practice of to-day, is not well indicated in the present preliminary notice. Percolation is perhaps the most important process of the pharmacist, and particularly important because under all circumstances even a moderate degree of success requires much knowledge and skill; and because failure so often occurs undetected. Your reporter has so often seen results in his own hands, where all that the Pharmacopœia gave him, and more than this, were carefully and conscientiously applied, which results were so far from what the Pharmacopœia requires and expects, that it leads to the opinion that the present directions are inadequate and delusive in regard to the practical exhaustion of drugs. Honesty of purpose being conceded, a considerable amount of knowledge, skill and experience are as necessary to successful percolation as they are to reading or writing, and while without these it is impossible to render any amount of detailed descriptions effective, yet a moderate amount of detail in each special case will best secure uniformity in good result. It must be impracticable to adapt the Pharmacopœia to any given degree of either ignorance or knowledge in those who are to

apply it, and therefore it does not appear to be wise in those who make it, to reject processes and formulas on account of their complexity and the difficulties which attend their proper application, no more than to reject detailed description of processes on account of their being unnecessary to the educated, or more appropriate to commentaries. The Pharmacopœia must almost necessarily adopt the best means that are known to attain its ends, irrespective, in a great measure, of the amount of knowledge or skill which may be necessary to apply them, since a code or standard which should be reduced to the comprehension of the ignorant of the class to whom it is addressed to-day, would add its influence to the arguments for a further reduction ten years hence. All your reporter's knowledge on the subject of percolation and repercolation are given in the papers which have emanated from this Committee within the past four years, and he suggests that repercolation be adopted in the new revision of the Pharmacopœia.

"FINENESS OF POWDERS."

The direction for fineness of powders would be better given by stating the mesh of the sieve in the body of each formula. What is commonly known as fine powder is that made by "dusting" in the mill called a chaser, and such will commonly pass through bolting cloth of 110 meshes to the linear inch. Such powder is often well adapted to percolation, but in some instances will not percolate at all. As a general rule, however, the finer the powder and the slower the percolation, the easier it is to attain the end, and there are but two or three drugs known to your reporter which can be successfully exhausted in coarse powder.

When to be administered in substance, the extreme fineness of powders which is commonly sought for and prized, is often unnecessary, while the process of powdering is always more or less hurtful. A good iron mortar in a pharmacist's store can and should yield nearly all the powders which are ordinarily dispensed from such a store in prescriptions, and the Pharmacopœia should give its influence against the common practice of buying many drugs in powder for prescription use, chiefly because the true character of such powders can never be known.

"MATERIA MEDICA."

On reaching the consideration of the division of Materia Medica, your reporter gives his judgment very decidedly in favor of a materia medica list, although the more recent Pharmacopœias, with the exception of the French, do not adopt it. It adds much to the convenience and simplicity of the work, and does not obstruct easy reference.

The sub-division into a primary and secondary list is, however, of doubtful utility, since it complicates the list without manifest reason, and obstructs easy reference by making it necessary at times to look over two alphabetical lists. The distinguishing characteristics of the secondary list are, that the articles there found are of secondary importance, or are under probation as liable to be dismissed, or promoted to the primary list, and do not enter into any of the officinal preparations of the Pharmacopœia. None of these characteristics are considered to be incompatible with their enumeration in the primary list, and it is therefore the judgment of your reporter that there should be but one list.

Your reporter has earnestly desired and strongly advocated for many years an entire change, and a great extension of the definitions of the substances composing the materia medica, and now approaches the subject as an often told tale, but one which a sense of duty still urges him to tell again. Of what practical use is it to either the physician or pharmacist to define the officinal acacia only as being the concrete juice of Acacia vera, and of other species of acacia; or to define rheum as the root of Rheum palmatum, and of other species of rheum.

It is now almost certain that the gum gedda used to adulterate the finest qualities of gum arabic is a product of some "other species of acacia," and it is therefore so far officinal. And it is well known that our common garden pie plant, which is now so successfully cultivated as an adulterant of powdered rhubarb, is one of the "other species of rheum," and therefore, so far as literal definition is concerned, is officinal. What seems desirable is that the article named should be so defined and described as to leave no doubt as to what is intended as to specific identity, and also to the grade of quality. The Pharmacopœia should be

very decisive and arbitrary in this, as well as very plain, leaving no room for any thing short of dishonesty. The characteristics of quality and kind in the officinal substance should not be given in smaller type, nor in any separate or secondary way, as in the British Pharmacopœia, but with all the prominence and authority that is possible, and in such detail as may correspond to the importance of the substance.

Thus briefly presented, the subject is left for your earnest consideration, and if the plan suggested should seem to be an improvement, let the Association use all its influence with the next Committee of Revision for some change in this respect.

There can be nothing more important to an officinal list than officinal authoritative directions and specifications in regard to the collection, preparation and preservation of simple medicinal substances, and therefore your reporter would strongly urge that the materia medica list be preceded by such directions. The admirable paragraphs by Dr. Wood upon this subject, with but little correction, as found at page 873, 874 and 875 of the twelfth edition of the U. S. Dispensatory, would form an excellent introduction to the list.

As it is quite inconsistent with the occupations of your reporter to afford the time and labor necessary to take up the substances seriatim, and suggest the desired additions and extensions, the report must be limited to special substances of importance, and to avoid verbiage and save time, the suggestions will be made in the shortest way.

Absinthium and *Acetum,* dismissed as useless.

Acidum Aceticum to be free from empyreuma. Easily ascertained by the odor when saturated, as in making liquor ammoniæ acetatis.

Acidum Chromicum to be free or nearly free from sulphuric acid.

Acidum Citricum and *Acidum Tartaricum* to be colorless and clean and dry, and not to be used in powder for chemical uses, as both are somewhat changed by kiln-drying and the heating and friction of mills.

Acidum Muriaticum. Rarely or never found colorless nor

absolutely free from sulphur compounds, and not necessary to be so for pharmaceutical uses.

Acidum Nitricum rarely or never colorless except when recently heated, and not necessary to be so.

Acidum Sulphuricum. As a practical fact it is impossible to get sulphuric acid in quantities having the s. g. 1·843. Once within the past six years your reporter induced a large manufacturer to make about ten carboys, the s. g. of which was 1·843, but it contained a little lead, which must have increased the s. g. This experiment was attended with so much injury to the platinum apparatus that it was never repeated, and this is the only occasion on which your reporter has ever seen officinal sulphuric acid from the ordinary sources accessible to the druggist and pharmacist. He is of the opinion that it can and should be made by the manufacturer, by care and the use of a different fuel under the stills, at a cost not greater than eight or ten cents per pound, paying three times the usual profit at this price. But from ignorance and want of care in those who use it, and from the plus inaccuracy of common hydrometers when used for sulphuric acid, the demand is too small to warrant manufacturers in producing it. The average of the best commercial acid called "Concentrated, 66° Baumé," has an average s. g. of about 1·835 by a good hydrometer. Whilst the best hydrometers usually mark about 0·002 too high with such liquids, when compared with a good s. g. bottle. By pains and care, and by going direct to the manufacturer with sufficient inducement in price to pay him for the trouble, an acid can always be had which, with the small amount of lead in solution, will have a s. g. of 1·839 or 1·840; and the variation in such acid appears to be more in the proportion of lead than in the true acid strength. It seems fair to infer, therefore, that with such acid, at best, the formulas of the Pharmacopœia are supplied in general use; and as the acid is otherwise of excellent quality and cheap, though very rarely colorless, it would be wise to name a lower s. g. for the officinal acid. The last test given, namely, hydrosulphuric acid, is of no practical use, since the writer has never seen a single specimen of commercial sulphuric acid so free from lead as not to respond affirmatively to a proper application of this test. Nor is it neces-

sary for pharmaceutical uses that it should be entirely free from lead, because, when diluted, the lead is practically all precipitated, and when used strong the lead is either precipitated or insignificant in effect if present only in small proportion. When sulphuric acid which is proper to be considered officinal is added to four times its volume of water, it should give only a faint opalescence. In good acid the precipitate which causes this opalescence is plainly seen only at the bottom of the test tube after standing twenty-four hours. The amount of lead thus indicated is not a serious objection for officinal uses.

Aconiti Folium. The color, odor, taste, and freedom from dirt and foreign plants, at least, should be made a part of the definition of the officinal drug. The same remark applies with equal force to all the leaves of the list, and the definition should be repeated with a detail and precision proportionate to the importance of the substance.

Aconiti Radix. Color, color of fracture, size, soundness, proportion of stalk, cleanness, taste and the impression made by minute portions on the tongue, with a caution in regard to tasting, should all form a part of the officinal definition. A very minute fragment from the broken surface of a root, detached carefully by the front teeth, and chewed there in contact with the tip of the tongue for a moment or two only and then rejected, will not at once, but only after a few moments, develope a tingling numbness of the part of the tongue which was touched by it, and the strength and duration of the impression well indicate the activity of the root. As the impression from one root must pass away before another can be tried, only three or four pieces can be thus tried in a day, and three or four days will be required to judge a sample, but the result is critical and conclusive, and some good test is highly necessary. No sample should be accepted in which one root in three is either inactive or only faintly active. Much caution is necessary, in applying this test, to avoid very disagreeable and even dangerous effects, since the substance is highly poisonous. But with common sense and judgment it is entirely safe, and after a few trials is as easy as it is effective.

Adeps should be white, and free from rancidity and from water. Often has a scorched odor of acrolein, against which it should be guarded.

Alcohol Amylicum is always obtained from spirit during the process of separation and rectification. The crude substance is supplied by rectifiers more than by distillers, and is rarely, if ever, obtained as described. The officinal liquid should be quite colorless, instead of "nearly colorless."

Alcohol Fortius. Drop the word "officinal."

Allium, Althæa and Angustura. Dismissed as being useless. Some of these articles, though not entirely useless, nor unused, are still of so little importance, and so rarely called for in comparison with a multitude of articles which would not be admitted to the list, that consistency, as well as utility, argues for their dismissal.

The three varieties of aloe are greatly in need of well-guarded characteristic definition.

Aurantii Flores should be substituted by orange flower water.

Belladonnæ Radix. It is practically impossible to determine whether any root of belladonna is from a plant more than two years old. The sensible properties of good root, and the proportion of atropia should form part of the definition.

Bismuthum. Bismuth is sometimes adulterated with antimony, and this is easily detected by its precipitation as teroxide during the solution of the mixed metals in nitric acid.

Buchu. Three varieties are common in commerce, and their sources are given in the British Pharm. They are known as "Long," "Long-short" and "Short Buchu." From frequent observation and experience your reporter is of the opinion that there is little difference in the relative medicinal value of these when gathered and kept with equal care, and therefore the definition should aim at the condition rather than at the variety. The "Short" is the lowest in price, and therefore has the largest demand and excites most competition in price. These circumstances react upon the producers, and latterly it is common to see it, not green and pungent in odor, but brownish-yellow, dry, brittle and feeble in taste and smell. The other varieties, from

slow sale, are liable to be deteriorated by age in odor and taste, though retaining their color. As ordinarily put up and kept there are few drugs which deteriorate so rapidly. Hence the definition should embrace freshness as an officinal requisite.

Calx Chlorinata. The standard for this substance is too low, and the test by which its quality is determined should be modified so as to indicate the percentage of available chlorine.

Cardamomum. The aromatic value of cardamom varies very much, and therefore the better varieties should alone be recognised.

Cascarilla, Castoreum and Cataria should be dismissed.

Chenopodium, and Coccus, should be dismissed.

The Cinchonas should be elaborately characterized, and a good simple process of assay should be given.

Cinnamomum. Two varieties so different in all respects should not be associated under one head. If both are to be retained, separate them. One however is sufficient, and that should be the best.

Conium. The unripe fruit should be substituted for the leaf.

Creasotum. As obtained from wood-tar, this substance is dear and comparatively inaccessible, and has not been used to any practical extent for some years. The mixed phenols obtained from coal tar, used under the name of impure carbolic acid, are medicinally identical with it, and much cheaper. The natural mixture can be had in great abundance, is easily defined and characterized, and is all that is needed for any known purpose.

Creta, Dulcamara, Elaterium, Erigeron, Erigeron Canadense, Eupatorium, and Fermentum. Dismissed as useless.

Digitalis. Impossible to know whether leaves accessible are "from plants of the second year's growth."

Ergota. A very large proportion of that used appears to be from other grain than rye. Is such ergot to be regarded as not officinal?

Extractum Cannabis. It does not answer a good purpose to submit the high priced English extracts to the process of purifi-

cation, on account of their cost; and there is no East India extract seen in the markets. It is therefore suggested to introduce the dried tops of Cannabis sativa, and give a process for preparing the extract under Preparations.

Gaultheria, Geranium, Granati Fructus Cortex, Granati Radicis Cortex, Guaiaci Lignum, Hæmatoxylon, Hedeoma and Humulus. Dismissed as useless, their therapeutic properties being better represented by other officinal substances.

Ipecacuanha. Carthagena Ipecac should be well examined, and either be admitted or distinctly rejected.

Limonis Cortex and Limonis Succus, dismissed as useless.

Manganesii Oxidum Nigrum. The standard 66 per cent. is quite too low. A process of testing should be given.

Marrubium, Matico, Matricaria, Mentha Piperita, Mentha Viridis, Mezereum, Monarda and Myristica. Dismissed as useless.

Oleum Bergami, Oleum Bubulum, Oleum Cajuputi, Oleum Rosæ, and Oleum Succini, dismissed as useless.

Opium. Requires a far better definition, a good simple process for assay, and a maximum limitation, the latter because opium of more than double the ordinary morphia strength has been imported to avoid duties.

Papaver, Pimenta, Pix Burgundica, Pix Canadensis and Pix Liquida. Dismissed as useless, or as mere alternatives of better substances.

Plumbi Carbonas. Dismissed as useless.

Potassæ Chloras. Very rarely if ever met with in such a condition that its solution gives no precipitate with nitrate of silver.

Salvia, Sambucus, Santalum and Scoparius. Dismissed as useless.

Sinapis Alba, Sodæ Sulphas, Spiritus Myrciæ, Staticæ, Stillingia, Styrax, and Syrupus Fuscus. Dismissed as useless.

Terebinthina, Terebinthina Canadensis, and Testa. Dismissed as useless.

SECONDARY LIST.

In glancing over the articles under this sub-head, with a strong desire to be conservative, and to regard surplusage as among the least of the faults of a pharmacopœia, and also with a strong bias toward the indigenous Materia Medica, there are but few which in your reporter's judgment can be usefully retained.

"Mild aromatic tonic and astringent," "simply tonic," "elegant aromatic tonic," "emetic" and "tonic," "emetic and cathartic and sometimes diuretic," "gentle stimulant and diaphoretic," "stimulant diaphoretic," "local irritant," "aromatic stimulant tonic," "diaphoretic and expectorant," are the prominent therapeutic properties ascribed to the articles upon the first page of this list by the best authority in the profession; and the changes in these combinations of properties are rung throughout the list with variation enough to avoid literal repetition. When it is remembered that a prolonged trial, in most instances, has only accumulated this testimony; and when the testimony is cross-examined in the light of modern physiology and pathology, it ceases to be evidence in favor of their being longer retained in the list. The circumstance that the therapeutic effects so far as studied have failed to appear either prominent, new, or characteristic, and are at best but alternative means of accomplishing ends which are better reached by substances which are better known,—or at least better studied. There are, however, some articles in this list which are doubtless entitled to an officinal position, for reasons which cannot, and need not be enumerated here. These are as follows:—

Calamus. A pure, efficient and agreeable aromatic, which might well be substituted for some of the dearer foreign aromatics.

Cypripedium. One of the best of the indigenous alternatives for valerian.

Gelsemium. A potent definite agent, which stands out in greater prominence the more it is studied and applied. Possessing great individuality, it is undoubtedly deserving of extended investigation.

Gossypii Radix. As an alternative for ergot, but requiring more extended and accurate research.

Hydrastis. As not sufficiently known.

In order not to conceal the apparently radical character of the change proposed for this list, it should be mentioned that the list now contains seventy-five articles, of which it is proposed to dismiss seventy, and to transfer the remaining five to the primary list, which would then be simply The List.

In connection with these somewhat startling propositions for the "massacre of the innocents" of the Materia Medica Lists, let it be remembered that there would be two hundred and fifty articles upon the list. Of these about one hundred and five are not strictly therapeutic remedies, but enter into the compounds of the Pharmacopœia; such as the acids, metals, metalloids, aromatics, oils, alkalies, etc. This leaves about one hundred and fifty-five simple substances, which, either simple or in various compounds and combinations, would form the Materia Medica as applied for therapeutic uses.

Few physicians, including the emergencies of an ordinary life time, use half this number of substances. And the very few who, through knowledge, ignorance or polypharmacy, are most prolific in the resources of their art, will rarely exceed a hundred simple articles in the most extended practice.

PREPARATIONS.

No introduction nor general directions under this head are necessary, for the reason that each preparation should be made entirely complete within itself. A knowledge of the outlines and general principles of natural philosophy, chemistry and botany is all that the Pharmacopœia should demand of the physician or pharmacist who undertakes for the first time to apply its formulas and processes.

That is to say, that in the best judgment of your reporter, every process should be given so fully and with such accurate consecutive detail, that a common education with moderate ability would secure a practical degree of uniformity in result. Many of the processes are now but skeleton outlines; and most of them need items of detail which are as indispensable to the required result as the quantities of the ingredients. It seems greatly to be desired that the Pharmacopœia should be freed from typical processes, and from comprehensive expressions and

generalizations which require special definitions. The greatest simplicity, plainness and accuracy are often quite inconsistent with the greatest brevity and conciseness of expression ; and as the Pharmacopœia aims for arbitrary authority and inflexibility it must have precision, and this cannot be attained without detail. Hitherto it has been so comparatively useless without a commentary that it is scarcely generally known, and the question still is, shall it remain to be an half explained and therefore more or less ambiguous catalogue ? or shall it run the risk of needing no commentary ? There is an intimation from the surviving author of the best commentary that has ever been given of any Pharmacopœia, see U. S. Dispensatory, p. xi, "that, considering his advanced age, it is hardly probable that he will live to see or at least participate in another revision." This forewarning has not been realized, and we have him still, with his accumulated knowledge and ripened judgment, to guard and guide us by his learning and labor. But we have his forewarning still, and when through advancing age he may choose (as none such ever do choose, but always wear the harness) to retire from the active labor of a most laborious work, where shall we look for such a commentary ? Commentaries we may and doubtless will have, but if the opportunity be afforded they will be laws unto themselves, and their constructions of ambiguous or indefinite expressions may vary, with confusion and debasement of standard as an inevitable result.

Without then attempting what might be the useless labor of revising these processes which appear to need it, according to the unsafe views or practice of a single individual, your reporter will simply aim at pointing out those features of the processes which are most ambiguous, or which are mistakes in themselves, or lead to such in their results. The time and labor necessary for modifying these processes, and giving them what is believed to be the requisite elaboration and detail, is not avoided nor withheld from any other motive than that of its possible and probable inutility. Ten years ago your reporter urged many of these same views ; and subsequently, when acting as a member of the Committee of Final Revision and Publication, his advocating some of them cost the Committee

much valuable time and labor, and probably seriously delayed the publication of the work without proportionate advantage. Time becomes very sensibly of more value to us as we grow older by these ten year stages, and it behooves us at each stage to see that it is better spent.

The paragraphs of characteristics and tests which are supplementary to the processes require as much extension and elaboration as do the processes themselves.

Many of the preparations could be wisely transferred to the Materia Medica List, not only because they rarely are or need be made by the pharmacist, but also because they cannot be properly or safely so made, and because the time and labor at his disposal are insufficient for the more simple processes which never should be given up to the manufacturer or druggist. The processes alluded to, such as those for benzoic, tannic and valerianic acids, ether, the chlorides and oxide of mercury, etc., as they stand, appear simple and easy, and even with any proper elaboration would appear comparatively so, yet they are only attractive to the novice in pharmacy, and tempt him to risk his own life and the lives of others, by a simplicity which is apparent only, and, by being authoritatively placed in a category of more simple processes which he is required to practice. It is quite inconsistent in the Pharmacopœia to deny place to assayed preparations of opium, aconite, etc., on the ground of complexity, and yet retain processes for the alkaloids of these drugs. And, in the presence of such processes as that for dilute hydrocyanic acid, the antimonials, the preparations of iron, and even compound extract of colocynth and ointment of the nitrate of mercury, what shall be said of the argument against repercolation on account of its complexity. It is really very difficult to know where to draw the line between processes appropriate to practical pharmacy and those which are not; but it must be drawn somewhere by the authority of the Pharmacopœia, and to do this with the least practicable inconsistency is what should be aimed at. Hypercriticism never ends, and can neither be well defined nor avoided, but to refuse logical inferences, and resist reasonable deductions and conclusions on account of this, is not wise. With these generalizations the list of preparations may now be briefly reviewed.

ACETUM COLCHICI.

This preparation, during many years past, appears to be superfluous, if not badly contrived, on therapeutic grounds. It should be dismissed.

ACETUM DESTILLATUM

Possesses no known or claimed advantages over dilute acetic acid, and is only offered as an alternative or substitute. This, when the acid is so abundant, cheap and generally good, is regarded as unnecessary.

ACETUM LOBELIÆ.

Some years ago it was hoped and expected that lobelia would, to a useful extent, take the place of ipecacuanha and squill. It has now been long and thoroughly tried, if not much abused, and has pretty nearly disappeared from the current literature of the professions of medicine and pharmacy. The usage of the time is therefore against it, and although it might not be wise to exclude it entirely for fear that its excessive use may have temporarily damaged a really good character; and as this is the only officinal preparation of it remaining, and probably the best that can be devised at present, it should be retained, but the alternative process by maceration, here and elsewhere, should be dropped as being imperfect and unnecessary.

ACETUM OPII.

The practice of returning a percolate to the percolater is erroneous and properly obsolete. A cloudy percolate is always evidence of mismanagement, and should not be officinally recognized.

ACETUM SCILLÆ.

An accidental error in this process, as given, renders it impracticable. This is corrected in the U. S. Dispensatory, where also a fact is mentioned which was before unknown to your reporter, and unsuspected. If vinegar of squill does deteriorate by keeping, the plan of making it when wanted as a part of the process for the syrup into which it enters should be adopted, as in the British Pharmacopœia.

ACIDUM BENZOICUM.

Transferred to the Materia Medica List, with proper definition to exclude both the so-called German acid, and hippuric acid.

ACIDUM HYDRIODICUM DILUTUM.

The officinal process is very difficult and troublesome, almost to impracticability, on account of the sulphur being precipitated around and enclosing portions of the iodine, and in proportion as this occurs the preparation is deficient in strength. Besides, the process is not well adapted to pharmaceutic practice, on account of the effect and odor of sulphuretted hydrogen about a store or store laboratory. The chief objection to it is, however, that there is a much more neat, cleanly and simple process, namely, that of Dr. Buchanan, of Glasgow. This process was examined by a member of the Association, Mr. John A. Dunn, of Brooklyn, who reported a good formula and process to the annual meeting of last year. His paper may be found in the Proceedings of last year, at page 383. Strength should be stated.

ACIDUM HYDROCYANICUM DILUTUM.

The officinal acid loses strength on exposure to air, so that in weighing off the 100 grains for testing the loss is sufficient, and is so variable as to render the method given practically inaccurate.

ACIDUM PHOSPHORICUM DILUTUM.

When made from glacial acid, as is most common, it often has a pink color, and almost invariably gives a precipitate with sulphuretted hydrogen. It should therefore always be treated with this reagent. The strength should be stated.

ACIDUM SULPHURICUM AROMATICUM.

The process fails to direct the powders to be moistened for packing, and without that they cannot be properly percolated. On mixing the acid mixture with the percolate a bulky precipitate occurs within a month. The old Edinburgh plan of percolating the powder with a mixture of the acid with the whole of the alcohol is better. The strength in monohydrated sulphuric acid should be stated.

ACIDUM SULPHUROSUM.

The sentence commencing with the words "connect the mattrass" is badly constructed, and literally followed defeats the process. The strength should be stated.

ACIDUM VALERIANICUM.

There are at least two considerable errors in this process, one of which defeats the object. See a paper on the subject by a member of the Association, Mr. F. C. Mussgiller, in the Proceedings for 1868, page 396.

ACONITIA, ATROPIA, STRYCHNIA, AND VERATRIA.

The processes for these alkaloids are given with a precision, accuracy and detail, which leaves little to be desired. They are more practically and more effectively presented to the pharmacist than any of the formulas of the Pharmacopœia, and it is to be regretted that they are among the least useful, because so rarely practised. The quantity of animal charcoal, where this is used, should be definitely prescribed, because it is so very common to use it in excess, and thus diminish the yield of alkaloid. Whether these processes are the best at this time, your reporter does not know.

Under present circumstances, it seems probable that these alkaloids might be wisely transferred to the Materia Medica list, if properly described and guarded. They would be about as often made by the pharmacist then as now, whilst the operator would be left to take the most recent process, or the one best adapted to his peculiar facilities. What the Pharmacopœia attempts now is only to select the best processes of the ten years which are past, and give these in less detail and with less elaboration than they are given in the sources from whence they are taken. But it also gives to the processes selected an authority and sanction very useful, and often much needed. In the judgment of your reporter this is an open question.

ÆTHER AND ÆTHER FORTIOR.

These preparations should both be transferred to the Materia Medica List, or else the æther fortior should be thus transferred

with very careful description and guarding, and the æther be dropped altogether. The present æther fortior would then become simply æther: and where alcoholic ether is required for pharmaceutic uses it should be definitely diluted at the time. The present arrangement was adopted chiefly upon the advice and experience of your reporter, and he may therefore freely say that it is a very bad one. The preparation of ether should never be undertaken by the pharmacist, and never can be undertaken without nullifying his insurance policy. Beside which, without special adaptation of apparatus it is dangerous, not only to himself, but which is of much more importance, dangerous to all who are casually near and not interested. If this be true, the Pharmacopœia is not justified in prescribing that it either shall or may be done by authority.

In the next place it rarely, if ever, is done by the pharmacist, and can rarely be done by him either properly or economically; whilst with proper and easy discrimination it can always be had of good quality in the common markets, at prices not out of proportion to its strength and cleanness. It is about as easy for the manufacturer to produce the present æther fortior as to produce ether of inferior strength and purity, and if he could get an equal or proportionate profit he would as willingly make it, so that it would be really not only better for the pharmacist to create a demand for the stronger ether and dilute it himself, but would be cheaper in the end. The present officinal æther contains from 27 to 30 per cent. of alcohol and water, beside containing objectionable hydro-carbons. The æther fortior contains from five to seven per cent. of alcohol, and is practically, though not chemically, free from the objectionable hydro-carbons. If therefore the ether for pharmaceutical purposes should be made by diluting the stronger ether, it would be of much better and more uniform quality.

FORMUM PURIFICATUM.

The word nearly should be introduced after "distil" in the direction to "distil to dryness." And the words "when mixed with an equal volume" should read "when shaken with an equal volume." The less critical but more practical test of quality,

which consists in observing the odor of the last portions of chloroform under examination, as it evaporates from bibulous paper, should be given.

OLEUM ÆTHEREUM.

A necessary direction to wash the oil with a dilute solution of carbonate of soda (one ounce to the pint of water) before mixing with the ether, is unaccountably omitted from this process.

The characteristics which belong to it, as the heavy oil of wine, in contradistinction from light oil of wine, should be given, as these paragraphs are often referred to in examination of substances purchased.

ALUMEN EXSICCATUM.

It is useless to direct the alum to be taken in coarse powder, since it fuses at once on being warmed; and it is practically impossible to make an uniform nice preparation without powdering it when dry, previous to the final heating. The lumps become too much dehydrated and insoluble on the outside, and too little dehydrated within. The temperature directed is unnecessarily high, and without great care is hurtful.

There should be a paragraph of characteristics and tests, as the preparation is very liable to be badly made.

ALUMINÆ SULPHAS

Should have a paragraph of characteristics and tests if it be retained, but it is regarded by your reporter as a useless preparation.

AMMONIÆ VALERIANAS.

The wording of this process, in order to be compact and brief, is so unusual and so parenthetical as to be not only clumsy, but ambiguous as well. The acid must be kept warm or the salt will crystallize in the delivery tube and burst the apparatus. When properly made there is nothing to drain from the salt, and the farther direction, to "dry it on bibulous paper," is equally unnecessary.

ANTIMONII ET POTASSÆ TARTRAS

Should be transferred to the materia medica list, and there would then be no necessity for the next succeeding preparation, the oxide of antimony. The process for the latter is one of the most difficult and complicated of the Pharmacopœia, and the ox-

ide is only used for making tartar emetic, having been superceded in therapeutics by the oxysulphuret, or Kermes mineral. Should be oxysulphide.

ANTIMONII SULPHURATUM

Should be dismissed as an inferior and unnecessary duplicate of the oxysulphide.

AQUA AMMONIÆ.

Unless the muriate of ammonia be purified, or a wash bottle be used, the product of this process will not be free from foreign odor and empyreuma, both of which are objectionable for medical uses.

It is questionable whether this process should not be omitted, and be substituted by one of simple dilution of the aqua ammoniæ fortior.

AQUA AURANTII FLORUM

Should be transferred to the materia medica list. See Gobley's test, Proceedings for 1866, page 148.

AQUA CAMPHORÆ.

See paper by a member of the Association, Mr. G. F. H. Markoe, in the Proceedings for 1865, p. 153. Does the camphor not crystallize out of the officinal solution in cold weather?

AQUA CREASOTI

Should be filtered.

AQUA DESTILLATA.

In this process is found a curious instance of the sacrifice of common sense to English grammar. The direction is "Distil two pints, using a tin or glass condenser, and throw them away; then distil sixty-four pints, and keep them in glass bottles." The throwing away the condenser is not justly chargeable to grammar; but the sixty-four pints of water, requiring a relative pronoun in the plural, is grammatical nonsense.

ARGENTI NITRAS.

The solution should finally be evaporated to dryness, being stirred into a granular condition. This shortens and simplifies the process, is more economical, and yields the product in a more convenient condition for use. The test by burning with sugar should be given here.

ARSENICI IODIDUM.

The reaction is best started in the mixture by dipping the very lowest portion of the flask, or just touching it for a short time to hot water. The reaction is then more gradual, and less iodine is sublimed out before the combination is effected.

BISMUTHI SUBCARBONAS.

This process, which was adopted at the suggestion of your reporter, needs, after prolonged experience, a few modifications, which, though apparently trifling and insignificant, are really as important to the production of uniform and accurate results as the quantities of the formula. Even with the greatest care and a prolonged experience there is still a small and unaccountable variation in the composition of the product. Nine and a half per cent. fairly represents the average loss on heating, yet there are occasional slight variations from this in an extended experience.

The first direction, to "press out as much of the liquid as possible," is unnecessary, and should be omitted. The direction to heat nearly to the boiling point after adding the second portion of the nitric acid, is not only unnecessary but hurtful, and when omitted, as it should be, the necessity for diluting the solution to permanent milkiness is avoided, and the solution requires to be simply diluted with four fluid-ounces of distilled water instead of this whole sentence. In the next paragraph, the carbonate of soda should be dissolved in twelve fluid-ounces instead of "twenty fluid-ounces of distilled water." Finally, the direction to "press the precipitate," should be omitted, and, instead of bibulous paper, it should be dried slowly in little mounds, on common delf plates in a room free from gases and odors.

The water of ammonia used in the first precipitation should be diluted with an equal volume of distilled water.

BISMUTHI SUBNITRAS.

This process requires to be modified in exactly the same points and in the same way.

CADMII SULPHAS.

This preparation should be dropped as useless. It is but a dear substitute for sulphate of zinc, which became fashionable for a short time. If omitted, the metal cadmium should be dropped from the list, as this is its only use.

CRETA PRÆPARATA AND TESTA PRÆPARATA

Should both be dismissed as useless. The processes are both imperfect, and, if retained, the processes should be improved.

CARBO ANIMALIS PURIFICATUS

Should be heated to redness out of contact with the air, after drying it.

CERATUM ADIPIS.

This, and all other cerates into which white wax enters, should have yellow wax substituted for the white. A paper by a member of this Association, Mr. Ferris Bringhurst, appears to decide this point very definitely. See Proceedings for 1867, page 78, and for 1868, pages 116 and 416.

CERATUM EXTRACTI CANTHARIDIS.

All the experience in practice which your reporter has been able to collect is so favorable to this preparation that he would advocate the dropping of the old ceratum cantharidis in favor of this.

In the process the resin, wax and lard should be melted together and strained before the extract is added, and then the final straining is unnecessary. Flannel is better than muslin for straining cerates, and blanket often better than either, though muslin is directed in all the cerates which are strained.

CINCHONIÆ SULPHAS.

This preparation and sulphate of quinia should both be transferred to the Materia Medica list.

COLLODIUM.

It happens that of late years gun cotton is made on the large scale and cheaply, for photographic uses, and is easily bought in any quantities. It also happens that this kind of gun cotton is that best adapted to make collodion for surgical purposes.

Then, as it is not always easy for an ordinary buyer in small quantity to get cotton which is fit to make gun-cotton of, and as the process in ordinary hands is difficult, precarious, and not free from danger, it is suggested that gossypium (cotton) be dropped from the Materia Medica list, and that pyroxylin (gun-cotton) be substituted for it. The fact that collodion is used surgically for two distinct purposes, at one time for its contractile properties, and at others for its simple protecting influences, is recognized in the British Pharmacopœia by providing two distinct preparations, and it would be well to follow this example. The present formula contains too little gun-cotton and makes too brittle a film for most uses, while it contains too much for the greatest degree of contraction ; and a series of experiments have been made in the laboratory of your reporter by one of his assistants, who is a member of the Association, and Mr. Mussgiller presents his paper upon the subject at this meeting.

Five or six per cent., or even more, of coal tar creasote or impure carbolic acid may be added to collodion, forming a phenol-collodion, with very great advantage for many uses. Such a preparation is hardly advised for the Pharmacopœia, because it is made by the simple addition of the phenols to the collodion. But it is well calculated to supercede most of the "carbolic acid plasters," so-called.

The cantharidal collodion should be made from the flexible variety. There is some doubt as to whether this preparation is strong enough in vesicating properties. One minim represents but half a grain of cantharides, and, when well made, complaints of want of activity occasionally occur.

CONFECTIO SENNÆ.

It is probable that a clerical error has been made in this process. When carefully and critically used it produces a mixture which is much too thin for a confection, and which speedily spoils. It has, therefore, been necessary to give up the preparation, or make it non-officinally. If the "pulpy liquid" be evaporated to eighty-four troyounces, and then the senna and coriander added, the whole will weigh ninety-six troyounces, as was probably intended. At least this makes a very good

preparation. See a paper by Mr. G. F. H. Markoe, Proceedings for 1868, p. 464.

DECOCTUM DULCAMARÆ AND
DECOCTUM HÆMATOXYLI

Dismissed as useless.

EMPLASTRUM AMMONIACI,
EMPLASTRUM AMMONIACI CUM HYDRARGYRO,
EMPLASTRUM ANTIMONII,
EMPLASTRUM ASSAFŒTIDÆ
EMPLASTRUM FERRI,
EMPLASTRUM PICIS BURGUNDICÆ,
EMPLASTRUM PICIS CANADENSIS,
EMPLASTRUM RESINÆ AND
EMPLASTRUM SAPONIS

Dismissed as useless.

EXTRACTA.

The general direction to evaporate to the consistence proper for forming pills is indefinite, and possibly from this reason, as well as from the difficulty attending it, it is rarely complied with. This appears to be recognised in the next paragraph, wherein the softer extracts are directed to be sprinkled with alcohol, unless this direction refers to all except the dry extracts.

The extracts generally are very much in need of good characteristics and tests.

As applying to both extracts and fluid extracts, your reporter strongly favors the introduction of repercolation, and of considerable modification of some of the menstrua. Hitherto it seems to have been the aim to use alcoholic menstrua just as weak as possible, to secure the holding of the active principles, and it occasionally happens that the menstruum used is so weak that the active principles are not easily washed out or securely held. This is bad economy. The alcohol should be used of that strength in which the active principles are most soluble, and all else least soluble; and the last condition is quite as important as the first. This amounts to saying that the alcohol should generally be used as strong as possible. By this much is gained in the percolation, more in the evaporation, and most of all in the character of the product.

The term repercolation has been objected to, and it is certainly

not a perfect one, if even a good one. But the only one proposed as a substitute seems to be no better, namely, Fractional Percolation.

The older process, which this is designed to improve, is a fractional percolation, and as much so as that now called repercolation. Yet as fractional percolation was never applied to the older process, it would be available for the newer one, except for the better reason that it does not express the essential point which needs to be expressed. To percolate means to strain through, and the word applies to the substance strained through, and not to the substance through which the straining is done.

In its original application and meaning it was just the reverse of its application in pharmacy; for straining through implies the separation of something by the strainer, or percolator, from the substance strained, or percolate. In our application of the word this seems to be reversed; the substance or liquid, instead of losing something to the strainer, takes up something from the strainer, and carries this portion away. This application, however, is not new, or peculiar to pharmacy, since very old standard authors wrote of water charged with mineral substances by percolating strata containing them. Then as "to percolate" means to run fluid through a strainer, so "to repercolate" means to run fluid again through a strainer; and hence this is the essential meaning of the term as embraced in repercolation, and it matters not whether it be run again through the same strainer, or through another, since there is nothing either in the construction or application of the word to indicate this point. To run the liquid or percolate from one operation through another strainer or percolator, and perhaps again through a third, is the process sought to be expressed in one word, and it seems pretty plain that this is better done by the word repercolation than by the two words fractional percolation. Beside, the latter expression carries it into a relation with fractional distillation and fractional condensation with which, essentially, it has no analogy.

In making solid extracts upon a moderately large scale, with a nicely adjusted menstruum, and by repercolation, with a little education, there is but little difficulty in accomplishing the best results practicable, namely, through exhaustion without waste of

menstruum, and with the least possible menstruum; and in the second step, the least waste of menstruum without heating or with the smallest amount of heating. The amount of knowledge and education required for the successful application of repercolation is not greater than the Pharmacopœia has a right to demand from all who use that standard, and is far less than it does require of all to whom its characteristics and tests for simple substances, and its processes for preparations, are addressed; and the inconsistency of urging complexity as an argument against the introduction of repercolation in the presence of a requirement to use Marsh's test, to make pyrophosphate of iron, or even the tinctura opii deodorata, may be again alluded to.

These remarks, and the deductions intended to be drawn from them, applying to solid and fluid extracts in general, it only remains to allude to some of the peculiarities of some of the formulas.

EXTRACTUM CANNABIS PURIFICATUM

Should be made directly from the tops. It is a mistake to direct it to be evaporated to dryness.

EXTRACTUM CINCHONÆ.

See Am. Journ. Pharmacy for 1867, pp. 289 et seq.

EXTRACTUM COLOCYNTHIDIS ALCOHOLICUM,

If properly managed, need not have the seed separated. Well made extract of colocynth cannot be powdered so as to remain even in coarse powder, in consequence of its oily nature.

EXTRACTUM COLOCYNTHIDIS COMPOSITUM.

The alcoholic extract of colocynth cannot be made into fine powder alone; but may be powdered with the aloes and resin of scammony. Purified aloes should be substituted for the socotrine aloes. And the proportion of cardamom should be increased, or other corrigent added.

The preparation of this extract, by simply mixing the powdered ingredients, is bad. The aloes and soap particularly need combination rather than admixture. There are perhaps few preparations wherein more is sacrificed to simplicity.

EXTRACTUM CONII AND EXTRACTUM CONII ALCOHOLICUM

Should both be made from the unripe fruit, and by a special process. See Dr. Manlius Smith's papers in Trans. N. Y. State Med. Society, and Dr. John Harley's work on the Old Neurotics.

EXTRACTUM DULCAMARÆ

Dismissed as useless. Also,

EXTRACTUM HÆMATOXYLI.

EXTRACTUM IGNATIÆ ALCOHOLICUM,

Little used and of doubtful utility, because it appears to be but a duplicate of the similar preparation from nux vomica.

EXTRACTUM JALAPÆ.

It has been abundantly shown that the aqueous portion of this extract is inert and useless, whilst it impedes and complicates the process very much, and gives a product difficult to powder, and still more difficult to keep in powder. There is no demand for this extract in the officinal form, it being always required in powder.

EXTRACTUM NUCIS VOMICÆ ALCOHOLICUM.

This preparation also is invariably required in powder. Some provision for separating the inert fixed oil is badly needed.

EXTRACTUM OPII

Should be made from opium, which has been dried and powdered.

EXTRACTUM PODOPHYLLI.

It has been shown by your reporter elsewhere that the aqueous portion of this extract is inert, and that it is equally troublesome with that of jalap.

In the fluid extracts your reporter has to suggest the substitution of glycerin for sugar throughout, for reasons now too well known to need recapitulation. Taken by weight glycerine is now not double the price of sugar, and is less costly than alcohol, and there is every probability that within a year or two it will be still much lower in cost. Even now officinal glycerin can be produced in this country at a cost to the maker of not over fifteen

or sixteen cents per pound. Its uses in pharmacy as a solvent and menstruum are not sufficiently investigated.

EXTRACTUM CINCHONÆ FLUIDUM.

See Amer. Journ. Pharm. for 1867, pp. 289, et seq.

EXTRACTUM CONII FLUIDUM

Should be made from the unripe fruit, by moistening with alcohol, grinding and expressing, and altogether without heat. A preparation of good uniform quality can be easily made in this way.

EXTRACTUM DULCAMARÆ FLUIDUM.

Dismissed as useless.

EXTRACTUM IPECACUANHÆ FLUIDUM.

The process for this fluid extract is not satisfactory. Ipecacuanha is occasionally met with which will give a satisfactory result from the officinal process, or but slight modifications of it. But as a general rule the inert resinous matter is very imperfectly precipitated, even by the repeated use of large quantities of water, and remains to render the syrup made from the fluid extract cloudy.

EXTRACTUM PRUNI VIRGINIANÆ FLUIDUM.

This is also an unsatisfactory process, and is much more difficult and complicated than repercolation. The preparation is not objectionable on account of complexity, and is exceedingly elegant and efficient when freshly made. But the hydrocyanic acid and essential oil rapidly disappear by change in keeping, and those physicians who use it most effectively often add hydrocyanic acid, or essential oil of bitter almonds, or both, when they use it.

Your reporter recommends a process of simple exhaustion of the bark by an alcoholic menstruum in the proportion of minim to grain, and the addition to this of a fixed quantity of hydrocyanic acid and oil of bitter almonds; or of leaving these additions to the physician at the time of using, if they should be found as unstable without the sugar as with it.

EXTRACTUM RHEI FLUIDUM.

This is another instance wherein the Pharmacopœia defeats its object by an impracticable process. As with cinchona, this preparation is so thick and viscid as to be unmanageable; and to such an extent that a portion made soon after the publication of the Pharmacopœia was returned as fast as it was sold. It was no valid defence to say that it was officinal, and that it could not be made officinal without this defective consistence, for the effect has been to create a prejudice against it which a subsequent modification of the process, in departure from the officinal process has not yet overcome in your reporter's neighborhood. This and some other preparations have taught your reporter the lesson that, where an officinal preparation proves, in his hands, to be inconvenient or objectionable in use, it is better never to offer it at all, no matter what its importance may be.

EXTRACTUM SARSAPARILLÆ FLUID. COMP.

The mezereon in this preparation is occasionally objected to by intelligent physicians, and its use is of doubtful advantage.

EXTRACTUM SPIGELIÆ ET SENNÆ FLUIDUM.

The carbonate of potassa seems to be objectionable in this preparation, on the ground that it is almost if not quite useless therapeutically, whilst it materially increases the nauseous taste.

EXTRACTUM VERATRI VIRIDIS FLUIDUM.

This is a preparation of very doubtful utility, and therefore your reporter recommends its being dismissed. So active a preparation cannot be needed in greater concentration than the officinal tincture, and is therefore unnecessarily dangerous.

FERRI CHLORIDUM.

This process requires much modification, as well as elaboration to avoid the production of a very basic salt.

FERRI ET AMMONIÆ SULPHAS.

The officinal preparation cannot be made by the process given, the chief obstacle being the necessity of free sulphuric acid in the solution when set to crystallize.

FERRI ET POTASSÆ TARTRAS.

Here again the officinal process fails to yield the officinal substance. Notwithstanding all that has been written upon it, and a long and varied experience with it, your reporter has never succeeded with the officinal proportions. The bitartrate of potassa is in excess. The heat prescribed is far too high; and a little carbonate of potassa is necessary.

FERRI ET QUINÆ CITRAS.

In all preparations where quinia is precipitated from the sulphate, many precautions and much more care are necessary than is generally indicated, and it is to be feared that such preparations are commonly very deficient in alkaloid strength. Frequent and strong objections are made to this preparation on account of want of ready solubility, and it is very often returned to the maker as useless. When freshly made, it is easily soluble to almost any extent in cold water, by simply allowing them to stand together for a few hours. As the preparation grows older it becomes less easily soluble, requiring more time, but your reporter has never tried a sample that did not dissolve in a few days. The salt parts with its water slowly and with difficulty, and resumes it in the same way, and the fact that these are among its therapeutic advantages, and prominent objects in its construction, is often overlooked through the ignorance of physicians and pharmacists. A tasteless preparation containing quinia and iron in an effective condition was the great need, and is so still. It was well supplied in this preparation, which was always to be given in powder or in pill. Its slow solubility rendered its impression on the stomach mild, gentle and agreeable, and slow but permanent, as tonics should be, going slowly and in dilute condition with the ingesta. But it had the misfortune to become fashionable, and that generally indicates extensive use without knowledge. Ignorant of the reasons for, and the advantages of, its condition, it was largely required in solution, wherein it is just as bitter and just as brusque in its action on the stomach as any other preparation of quinia. Of course it can very easily be rendered soluble, but the Pharmacopœia very properly resisted, and did not yield the solid advantages to popular demand. It

might be well, however, now to introduce some such preparation as that of the British Pharmacopœia under the present name for popular use, and add the word rubrum to the present name for that at present officinal.

FERRI FERROCYANIDUM

Is very difficult to wash clean on a filter as directed, but is much more easily washed by decantation, and yields a better product.

FERRI OXIDUM HYDRATUM.

In precipitating the oxide with ammonia the officinal direction should be just reversed; the iron solution being added to the ammonia.

In cases of emergency, if both solutions be but moderately diluted, both the washing and pressing may and should be dispensed with, as the sulphate of ammonia is not hurtful, and would probably aid in producing emesis.

FERRI PYROPHOSPHAS.

The dried phosphate of soda should be powdered before being heated in the shallow iron capsule, and when heated should be tested with solution of nitrate of silver. The solutiou of citrate of ammonia should be filtered before being added to the iron salt.

This preparation loses its ready solubility by age.

FERRI SUBCARBONAS.

The solution of sulphate of iron should always be added to the solution of carbonate of soda with rapid stirring, and never otherwise.

The precipitate should be washed by decantation and, when drained, should be dried in little mounds upon delf plates, and only at natural temperatures.

FERRI SULPHAS

Should be prepared in a granular form, and washed with alcohol before drying.

FERRI REDUCTUM

Should be transferred to the Materia Medica List, with careful description and tests.

HYDRARGYRUM CHLORIDUM CORROSIVUM,
HYDRARGYRUM CHLORIDUM MITE,
HYDRARGYRUM OXIDUM RUBRUM, and
HYDRARGYRUM SULPHURETUM RUBRUM,

Should all be transferred to the Materia Medica List, because, however skillful, the pharmacist cannot make them fit for medicinal uses on any scale adapted to his facilities.

HYDRARGYRI IODIDUM VIRIDE.

This name seems particularly inappropriate to a substance which never is nor can be green, but which is commonly almost as yellow as powdered rhubarb. Since alcohol is so costly, a hot solution of chloride of sodium is much more economical and is quite as good for washing the yellow iodide free from the red.

HYDRARGYRI SULPHAS FLAVA,

Dismissed as an useless therapeutic alternative.

HYDRARGYRUM CUM CRETA,

Should be made with the use of honey. See paper by Mr. J. P. Remington, in Proceedings for 1868, pp. 77, and 379.

INFUSA.

More than one-half of the thirty-one formulas for infusions are regarded as useless; and some of these are very irrational.

LINIMENTUM CALCIS.

Dismissed as useless.

LINIMENTUM SAPONIS.

This process does not hold all the soap in solution, probably from containing too little water.

LIQUOR AMMONIÆ ACETATIS.

The formula makes too much at a time, and the filtration should be avoided by the quality of the materials used. Should be left faintly acid and never alkaline.

LIQUOR FERRI CITRATIS.

In precipitating the hydrated oxide of iron, the iron solution should be added to the ammonia, and never *vice versa*. The

citric acid in this formula is in excess, and the temperature directed is too high.

LIQUOR FERRI SUBSULPHATIS.

As nitric acid is liable to vary in strength and still be near enough when judged by ordinary hydrometers, and as more or less is always driven off undecomposed, the stated quantity should be supplemented by the words "or a sufficient quantity," for it should of course always be used until the oxidation is complete, and there should be a direction for securing this by a test. The finished preparation should be made up by weight and not by measure. These remarks apply to liquor ferri tersulphatis.

The peculiar advantages of the solution of subsulphate of iron and its freedom from irritant properties are due to the small proportion of acid, and therefore it might be supposed that the less acid in its composition the better. Acting upon this assumption, your reporter some years ago made this solution with a smaller proportion of sulphuric acid, and called it liquor ferri subsulphatis minus. This was used by many physicians with close observation, and was generally supposed to be an improvement on the officinal. It is therefore suggested that the proportion of sulphuric acid be reduced as far as possible, consistent with the permanence of the preparation.

The percentage of iron and of oxide of iron in both this and the tersulphate should be stated.

LIQUOR GUTTA-PERCHÆ.

This formula and process has, in the hands of your reporter, been an entire failure, and is therefore considered altogether impracticable. A bottle containing twice the officinal quantities, put together with critical care by the officinal directions, has now been standing since Nov. 1868, (9 months,) and is still a dirty milky looking liquid, entirely unfit for use. The author of the process must have been misled by the use of some peculiar materials, as not unfrequently happens in the Pharmacopœia process.

The preparation is a very useful one, and the process should therefore be reconstructed.

LIQUOR MAGNESIÆ CITRATIS.

This formula and process, also, has, in the hands of your reporter, been an entire failure as far as pharmacy is concerned, and after trying many of the processes published during the past few years, that which seems to give the best results is published in the Am. Journ. Pharm. for 1867, p. 112, by Mr. John T. Buck, of Jackson, Miss., as being the formula given to him by Mr. Jas. W. Criswell, of Woodville, Miss. A bottle of this, now thirteen months old, is in good condition and without deposit.

LIQUOR MORPHIÆ SULPHATIS.

Dismissed as a useless preparation, and liable to be confounded with "Magendie's solution," which is sixteen times the strength, and much more commonly used outside of Philadelphia practice. If it be necessary to have an officinal solution of a morphia salt, it should be stronger than one grain to the fluid-ounce. But your reporter believes that no such solutions are either necessary or wise.

LIQUOR PLUMBI SUBACETATIS.

Much time and fuel may be saved by the simple introduction of the word "boiling" before "distilled water," in this process.

LIQUOR POTASSÆ and
LIQUOR SODÆ.

From some rude experience it seems probable that the recently published processes, wherein these preparations are made cold, are at least as good as the more troublesome officinal ones. But whether made hot or cold, unless the straining be followed with a treatment with lime, in small proportion, there will be a notable amount of carbonic acid in the preparation.

MAGNESIA

Should be transferred to the Materia Medica list.

MORPHIA.

The advanced cost of alcohol since the last revision renders the present process impracticable. In seeking for a better one, a modification of the original process of Gregory stands prominently forward, and has been adopted by the French and British

Pharmacopœias. Your reporter has frequently used this process among others and considers it the best one known at present, at least for Pharmacopœia purposes. It has the collateral advantage of saving the codeia. If there be a process better adapted to the Pharmacopœia it is the simple and effective one now relied upon by your reporter in making a preparation called liquor opii compositus, and the assays connected with it. This process is published in the Amer. Journ. Pharm. for 1860, p. 120, et seq., but has been considerably modified by the increased cost of alcohol and prolonged experience. As a morphiometrical process of assay, that of the younger Guillermond, as modified by M. Saint Plancat, appears, from two or three trials of it by your reporter, to be the best he has used. If further experience should confirm this judgment it should be adopted in connection with opium.

The recent Prussian Pharmacopœia abandons all these alkaloids as preparations, and simply describes them carefully and critically. This example your reporter would be unwilling to follow, unless the present processes for them should be replaced by careful processes of assay for both the crude drug and all the officinal preparations made from it. Thus, instead of the present process for morphia, this alkaloid might be transferred to the Materia Medica list, and a process given in connection with opium by which not only opium but all its officinal preparations could be tested.

MORPHIÆ ACETAS.

A very much better process for this preparation is to take glacial acetic acid in slight excess of the equivalent quantity, and combine it, undiluted, with the morphia in a mortar. All the evaporation etc. are thus avoided, and a little exposure of the resulting acetate in warm air frees it from excess of acetic acid.

MORPHIÆ MURIAS and MORPHIÆ SULPHAS.

These preparations are good examples of a very unnecessary and hurtful use of water common to all Pharmacopœias. It is not only entirely unnecessary, but positively injurious, to take in

each of these formulas a half pint of water, and then drive say half of this, at least, off by subsequent evaporation. It took your reporter many years to get out of this bad practice, so authoritatively taught by the Pharmacopœias.

OLEA DESTILLATA.

The prefatory remarks made under this sub-head are too meagre to be of much value. The general formula given for the preparation of these oils, and referred to under the separate oils as they are enumerated, can be only useful as a kind of definition, and as such might be much shortened by simply saying that these oils are generally prepared by distillation with water and steam. To any one practically acquainted with troublesome and delicate distillations the present paragraph does no harm, but to others it is liable to be "a delusion and a snare."

All these oils that are retained might well be transferred to the Materia Medica list, where many similar ones are at present found; and why they are thus separated at present is not very apparent. Many of them could well be spared altogether.

OLEORESINÆ.

Repercolation is well adapted to these preparations, and materially lessens the chief objection to their use, namely, high cost. They are most valuable preparations, and need only to be better known.

PILULÆ.

All pills containing aloes should take purified aloes. Many of the pills require glycerin to prevent hardening.

The Pharmacopœia should express itself either for or against the prevalent practice of sugar coating pills. If it be legitimate and good practice let it be adopted. If not, let it be characterized as non-officinal pharmacy, and be left to the nostrum venders. Your reporter is very much opposed to this practice on therapeutic grounds, and believes that the practice has only become general through the profits it yields to the enterprising manufacturers, and the skill with which it has been advertised.

The Prussian Pharmacopœia directs its only pill mass to be divided into two grain pills.

The Paris Codex, four years later, 1866, directs many of its pill masses to be kept in covered pots, and made as wanted into pills of prescribed weight.

The British Pharmacopœia, a year later than the Codex, simply prescribes the dose of the pill mass, leaving to the physician and pharmacist to decide upon the number and size of the pills. These supposed improvements in the pharmacy of pills appear to be all directed to avoid the hardening of pills by keeping, which has always been a serious objection to them. The use of glycerin, however, and the avoiding of any coating will obviate this hardening, and enable our Pharmacopœia to avail itself of a conservative course.

PILULÆ FERRI CARBONATIS.

The resulting mass varies with the density of the honey used. If the best natural honey be used the preparation is too stiff when evaporated to eight troy ounces as directed. This weight should therefore be changed to nine troy ounces.

The solution of sulphate of iron always requires filtration, and that of the carbonate of soda generally. The former needs protection during the filtration, but the latter does not. It is, therefore, better to add the two fluid ounces of syrup to the iron solution instead of adding one fluid ounce to each as directed.

PILULÆ FERRI IODIDI.

The iron is not only in unnecessary excess, but is troublesome and entails loss. One half the prescribed quantity, sixty grains, gives an excess of seven grains, which is quite sufficient.

The process is good until the evaporation, when the mass is found so tough as to be quite unmanageable. This springy or elastic toughness admits of the mass being rolled with difficulty, and the pills when cut and well rounded have an uncontrolable tendency to return to their square ended shape. The mass weighs 1280 grains, and this gives too large a pill. It needs to be reduced one-third, and to have the marshmallow replaced by something yielding a better mass.

PILULÆ HYDRARGYRI.

This formula and process needs amending in the manner urged by your reporter ten years ago.

PILULÆ QUINIÆ SULPHATIS.

This formula requires the addition of aromatic sulphuric acid, or, what is better—dilute phosphoric acid,—and glycerine.

POTASSÆ ACETAS.

This may be, and commonly is an apparently dry salt, while containing a very large and variable quantity of water not contemplated in the Pharmacopœia. Therefore it should be directed to be dried to a given weight by very careful heating and very active stirring.

176 parts of officinal acid require 100 parts of bicarbonate of potassa, if the latter be pure and dry, and these yield 99½ parts of the salt which the Pharmacopœia does or should intend to direct. The beautiful white, light commercial salt contains far more water, and the more the better the profit.

Bicarbonate of potassa often contains sulphate of potassa and other salts not decomposed by acetic acid nor soluble in the very cold solution formed by the reaction of this process.

POTASSÆ CARBONAS.

The impurities of impure carbonate of potassa, or pearl ash, are such that the product of this process is not considered fit for pharmaceutical uses, and it should therefore be improved or dismissed. Your reporter favors its dismissal, when the present potassæ carbonas pura would take its name and place, and be much better.

POTASSÆ CARBONAS PURA.

This process requires much amending; an iron crucible and fire are not necessary nor easily used with success; a covered porcelain capsule and gas flame being quite sufficient for both the heating and the evaporation. The quantity of water for solution should be twelve fluid ounces. The drying directed is insufficient and indefinite; it should be dried in a tared capsule until it weighs seven troy ounces and four hundred grains. It is then not very deliquescent.

POTASSÆ CITRAS.

There is a great excess of water here, and a proportionate amount of lost time and labor. Both crystals, in a one gallon

capsule with half a pint of distilled water, warmed over a gas flame, completes the solution in a few minutes. The saturation should then be tested and the solution filtered through white paper,—not strained, as directed. In drying it does not need rubbing in a mortar, and should not be passed through a sieve. It should be dried until it weighs fifteen troy ounces. The salt is yellowish-white,—not white.

POTASSÆ TARTRAS.

It is very objectionable to take carbonate of potassa rather than pure carbonate for this salt.

POTASSII IODIDUM AND POTASSII BROMIDUM

Should both be transferred to the Materia Medica list with very careful guarding and description.

PULVERES.

All the Pharmacopœias of later times give their negative influence against powdered drugs, and it is too often forgotten that, with the single exception of the Paris Codex, there are no officinal powdered drugs in the prominent Pharmacopœias. No Pharmacopœia can ever safely recognize the use of commercial powdered drugs in its processes. To see the drug before it is powdered, and to see that the powdering is in honest hands, is the utmost that should ever be conceded, and this should be definitely stated under this head.

PULVIS AROMATICUS

Deteriorates rapidly, and should not be long kept.

RESINA JALAPÆ

Should be made by repercolation, and be dried until it has a sharp resinous fracture when cold.

RESINA PODOPHYLLI.

See Amer. Journ. Pharm. 1868, p. 1. et seq. The present formula and process are very objectionable.

RESINA SCAMMONII.

The precipitation and washing with water are unnecessary; and the resin should be dried until it has a sharp resinous fracture.

SODÆ BICARBONAS

Should be transferred to the Materia Medica list, and be there well described and guarded, as it is liable to be very impure.

SODÆ PHOSPHAS

Should also be transferred to the Materia Medica List.

SODÆ VALERIANAS.

It is not judicious to dry this salt quite to the extent directed, because in so doing there is risk of decomposition. It may be dried by steam heat, so as to leave about 6 per cent. of water in it with advantage.

Purified carbonate of soda is better to saturate with than solution of soda, and is far more economical.

The salt is never quite white, in the experience of your reporter.

SPIRITUS ÆTHERIS NITROSI.

This formula is believed to be on about double the scale which is best adapted to the Pharmacopœia.

The s. g. given is too high. It should be 0·831 instead of 0·837.

SPIRITUS AMMONIÆ AROMATICUS.

This preparation is not so good as formerly, when made by distillation.

SPIRITUS LAVANDULÆ COMPOSITUS.

Omit the red saunders. It is hoped that the days for coloring matters in officinal preparations are past.

Some of the officinal spirits could be easily spared.

SYRUPUS FERRI IODIDI.

This process, accepted by the committee from your reporter, was however changed in an important feature in opposition to his advice and experience, now needs modification in two or three points.

The iron is taken in too great excess. Two hundred and twelve grains is the equivalent weight required, supposing the iodine to be dry and pure. Two hundred and twenty-five grains is sufficient, and more is troublesome and entails loss. A thin flask is not necessary, and the risk should be avoided. In

making any considerable quantities it should be set in cold water to moderate the reaction, and for the same reason the iodine should be added to the iron and water in small portions at intervals. The syrup should not be heated, because this favors its conversion into glucose; and only two fluid ounces of it should be taken, and this put into the bottom of a round-bottomed tared capsule. The point of the funnel used in the filtration should pass down through the stratum of syrup, and the filter should be a double one, and well wetted. In this way, should the filter break, as not unfrequently happens, the consistence of the mixture is not so much increased as to prevent filtration. Whilst if it breaks into the whole or a large portion of the syrup, the after filtration will be so slow as to spoil the whole by air contact. The filter should not be rinsed through, but simply drained, and the quantity should be made up by weight and not by measure. This weight is 12,453 grains, and the s. g. is 1·371.

SYRUPUS RHEI AROMATICUS

Does not make a perfectly transparent preparation, and the cloves is too prominent. S. g. 1·284.

Several of the officinal syrups could be dismissed without loss.

TINCTURÆ.

Many of these preparations are but useless therapeutic alternatives for each other, or for fluid extracts, and should be now abandoned. The strength of the menstrua used for tinctures requires re-examination.

TINCTURA CARDAMOMI COMPOSITA.

Drop the cochineal, and all these coloring matters wherever they are used.

TINCTURA IODINII COMPOSITUS.

There must be an error here in using alcohol instead of diluted alcohol. The iodide of potassium is not soluble in the mixture of alcohol and iodine.

TINCTURA FERRI CHLORIDI.

This formula and process has been used by the writer, by his assistants, and by some pharmacists in his neighborhood, for

many years with success. And if it was a little more elaborated and the necessary details supplied, it would be, in your reporter's judgment, unexceptionable, or at least much better than any substitute which has been published. It is not difficult for those who have repeated it often enough to become educated to it, to understand the difficulties so often complained of. These are of two classes, of which the first and most important is defective materials. The other is want of definite detail in the successive steps of the process; want of knowledge and skill on the part of the operator, and want of care. Few persons will succeed with any such process the first time, and it often happens that objections and difficulties, which appear grave at first, disappear with experience and the closer observation which this begets.

TINCTURA OPII—TINCTURA OPII DEODORATA.

It appears to be very desirable, if not necessary now, that these and all preparations of opium should have a definite prescribed morphia strength; that is, should be made by assay, or at least from assayed opium, and the strength be adjusted by dilution.

Early in 1860 your reporter made an assayed solution of opium;—or rather made it some time before, but published the formula and his experience with it at that time. This was called Liquor Opii Compositus, and a detailed account of it may be found in the Amer. Journ. Pharm. 1860, pp. 115 et seq. This was proposed to the Committee of Revision, but was rejected in favor of the present officinal tinct. opii deodorata. As soon as the formula of the latter was authoritatively published, your reporter made it, and offered it for sale, together with the assayed preparation, giving briefly the prominent points of both, but claiming that the Committee of Revision preferred the present officinal. This latter was also offered with a considerable discrimination in price in its favor, and physicians were asked to use it with, or substitute it for, the other. Beside this, it was always made from assayed opium, and was of uniform strength. This course has now been fairly pursued by your reporter for about ten years, with occasional reports from good authorities upon the comparative merits of the two preparations, the strength and uniformity

being the same. These reports have been without exception in favor of the compound solution, and its use has increased steadily and much more rapidly than that of the deodorized tincture, and this without any advertising of any kind, except the no small advantage of officinal authority and preference.

Under these circumstances, your reporter would recommend a change in the composition of the compound solution by replacing the compound spirit of ether, which it contains, by either chloroform, or acetic ether, or both, and its adoption in the next Pharmacopœia. There is now no doubt, in your reporter's judgment, as to the utility and efficacy of the process used for depurating the opium, nor of the assaying. Nor is there any doubt of the therapeutic advantage of the compound spirit of ether. But the odor of ether is very disagreeable and even nauseating to a small proportion of patients, and recent experience has shown that the modifying influence of chloroform upon opiates is very favorable and very useful. It has occasionally happened that, where the comp. solution of opium has been long kept with free access of air, particularly when kept in warm places or in warm climates, that the odor of ether and of oil of wine have disappeared and been replaced by quite as strong an odor of acetic ether. The preparation thus changed has in a few instances been well tried therapeutically, and, so far as these few trials go, has been considered to be unimpaired, whilst it has been more acceptable to the stomach. Successful and skillful French physicians have long habitually used acetic ether as a nervous stimulant and diaphoretic, and as an agreeable and useful corrigent very acceptable to the stomach. The chloroform and acetic ether, if used together, would make a very elegant preparation, and would protect the solution from change quite as well as the compound spirit of ether.

Whether this or any similar preparation be adopted in the next revision is, however, a matter of much less consequence than the making of all opium preparations by assay. And your reporter cannot too strongly urge this point in connection with the Pharmacopœia.

TROCHISCI CUBEBÆ.

This preparation is too strong in oleoresin. One-half or even

one-fourth the strength is much better adapted to the use of a troch.

UNGUENTA.

Yellow wax should be substituted for white wax throughout these preparations.

UNGUENTUM HYDRARGYRI.

The formula and process published, and proposed to the committee at the last revision, is again urged. The extensive experience of the army has shown that the proportion of suet might be still farther increased with advantage. The ointment best adapted to army use in all climates, and used now for many years, is made one-fifth lard and four-fifths suet.

UNGUENTUM HYDRARGYRI NITRATIS.

In this preparation the neats-foot oil should be replaced by an equal quantity of lard. Neats-foot oil, if ever fit for medicinal use, is only in such condition when purified and depurated to the consistence of sperm oil, and then it makes the ointment too thin. Beside, neats-foot oil is now-a-days obtained from such sources as to properly exclude it from Pharmacy. In the extensive general use of this ointment by the army, it was soon found necessary to depart from the proportions of the officinal formula, and the oil was step by step reduced and replaced by lard, until finally lard alone has been used for many years past.

VINUM ERGOTÆ.

There are two clerical errors in this formula, at least in the earlier edition of the Pharmacopœia.

ZINCI ACETAS.

This formula was faithfully and critically used, and with success, but was soon abandoned for that of simply saturating acetic acid with oxide of zinc. Oxide of zinc and acetic acid, both nearly chemically pure, are abundant in the markets when sought with discrimination, and the process is then simple and easy.

ZINCI CHLORIDUM.

Chlorine and oxide of zinc are better for removing iron than the nitric acid and chalk of the officinal process. And it is now

rarely difficult to get both muriatic acid and oxide of zinc which are perfectly free from iron, and therefore need neither.

ZINCI VALERIANAS.

This process is precarious and troublesome, but after trial of two others, your reporter knows no better one.

This terminates what your reporter has time to write, and all that could be appropriately read in the time which could be spared for that purpose. The matter here presented in its most condensed form was increasing up to the last moment, and therefore the writing of the report having been crowded into the last four or five weeks, is not as carefully and accurately done as it should have been. The question has been what not to say, rather than what could be usefully said, so that notwithstanding the time and labor given to it, the work needs an apology.

The important task of enumerating what has accumulated within ten years, which might be usefully or properly added to the Pharmacopœia, is too great for your reporter to undertake; and the literary labor and discrimination necessary for this work is beyond his ability.

In conclusion, let all who hear or read this report be guarded against the inference that because a few things have been found which have not borne the test of experience, and more that may be usefully amended, therefore we have a bad Pharmacopœia, or that there is nothing in it worthy of commendation. Because this report is in its necessary character and object a kind of hypercritical "black book," which has been for ten years kept against the Pharmacopœia, it is not to be taken for granted that the Pharmacopœia is deficient or imperfect in comparison with other Pharmocopœias, even of much more recent date. For, setting natural prejudice as much as possible aside, your reporter is impelled to offer his testimony to the supposed fact that, as it stands to-day, it is equal with any Pharmacopœia of the world; and so far ahead of our general practice in pharmacy, that nicely critical improvements upon it seem almost superfluous. Its merits have spoken for themselves, and it neither needs nor admits of laudation, if we have a proper respect for its dignity and authority. Defect and defection, both belong rather, or more,

to us than to the Pharmacopœia. If we would but conform our daily practices more to its spirit, and show more deference to its authority, we should be much better employed than in picking out its faults.

All of which is respectfully submitted to your serious consideration, by the Chairman of your Committee. The other members of the committee, Messrs. Procter and Taylor, not having seen this report, are in no degree responsible for its contents. And the Committee having now finished its work, considers itself discharged.

Brooklyn, Sept. 1, 1869.

NOTE ON RHUBARB.

For 1869.

BY EDWARD R. SQUIBB, M.D.

A note upon Rhubarb, presented at the last meeting of the Association, may be found in the Proceedings for 1868, at page 452. The market for this drug during the past year has undergone one of those changes which are so rarely met with as to warrant, if not to require, that the subject should be presented again at this meeting. It may be stated in few words, as a general fact, that the quality has very much improved, and the price for the better grades has very much declined. There is now in the New York market no difficulty whatever in getting rhubarb which is as good for medicinal purposes as rhubarb can be, for less than half the price at which it was then sold. Or rather, the rhubarb now offered by several New York importers at a very moderate price could not then be had in this country, and even in European markets was both high and scarce. Indifferent and bad rhubarb is as plentiful as ever, and also at lower prices; and the Custom House inspection seems to have run down also, for the writer knows of an instance in which a large lot of rhubarb which passed the Inspector of Drugs, and after remaining unsold for some time, finally brought one dollar a pound, on a credit of four months. As at least sixty-seven cents of this was duty, thirty-three cents was left as the market value of the rhubarb. What is done with the large quantities of these grades which are admitted into our markets in defiance of law, is a subject upon which we are at liberty to speculate.

In marked contrast with all such, however, the abundance of the better qualities may be more prominently noticed with more satisfaction, and the writer congratulates the Association upon the present prospect of unexceptionable rhubarb for the future at very moderate prices; and if we who are assembled here as representatives of the demand, do not run the screw of price away down, and put just the same pressure upon these moderate prices that we did upon the high prices, our supply will be sure and safe. If we do press for shades of price as we did before, and,

through the pernicious channel of brokers and brokerages, squeeze and manipulate the market to the utmost extent, we shall soon have but the dregs as we had before.

No reduction of prices can ever be of much avail to the consumer in such articles as this, so long as the trade is done through orders to brokers to buy and powder to the best advantage. It is not the fault of brokers that their business is ruining the markets, and ruining itself, even, by over-competition. Neither is it their fault that they are the natural enemies of the legitimate importer and the reputable trader. But it is our faults who employ brokers, and tacitly urge them to doing for us what we could not and would not do for ourselves. The above mentioned rhubarb at one dollar a pound was bought by brokers who are known never to act for themselves; and if the real owners be not represented in this Association, it is still within the sphere of this Association to control the demand for this quality of goods through these sources. There is another natural enemy to fair legitimate healthy trade in quality, which grows and flourishes within the influences of this Association, and by its invitation and encouragement, and whose effects are well illustrated by such an article as rhubarb. This is the travelling agent or "drummer," who sells goods by name, sample, and price, and saves purchasers ever so much money and trouble. This is but a private broker, whose salary, or percentage on sales, is but a brokerage in disguise, and he is employed, too, by many who inveigh vigorously against the same rose which smells less sweet under the other name.

The hurtful influence of this artifice of over-competition is no more justly chargeable to the agents nor their employers than in the other case, but is very justly chargeable to us, for their avocation would diminish with the profits accruing from it, and these are easily within our control. Our responsibility for the quality of the rhubarb we buy embraces all these points, and it is useless to try to evade this responsibility. The pharmacist who buys an important drug without first seeing it in a condition in which knowledge and judgment can be accurately and critically applied to it, must do so entirely upon the reputation of the seller; and low prices will generally make a pretty good reputation. The

writer presents herewith three samples of powdered rhubarb shown both upon yellow paper and upon the dark blue paper on which the samples are usually so artistically shown. Two of these are samples of rhubarb powdered by the writer, and all are confidently believed to be free from any admixture whatever. One sample is powdered from selected and carefully prepared rhubarb to be alluded to hereafter, and is worth $4.50 per pound. No. 2 is powdered from an inferior grade of large flat rhubarb, very much worm-eaten, and not fit for ordinary medicinal use. No. 3 is from a still lower grade of rhubarb. No. 2 is sold at $2.50, and No. 3 at $2.25, and No. 3 has been preferred to No. 2 at the same price, and when these two samples were presented together to the writer, he too gave a prompt and decided preference to the wrong grade. The point which it is desired to make here is, that no ordinary judgment is at all to be depended upon in the selection of powdered drugs. If these three samples of rhubarb were held by different houses, few if any buyers could distinguish the difference on going from one house to the other, and a difference in price of ten cents per pound would probably sell any one of them against the others. If the exhibition of these samples, all of high market grades, does not prove how unsafe it is to buy rhubarb, or indeed any other drug, in powder, it seems quite useless to try farther.

The writer wishes next to direct the attention of the Association to three cases of very good rhubarb on exhibition at this meeting, and has had them brought into the audience room for critical inspection and illustration. The first small half-picul case is from the house of W. H. Schieffelin & Co., of New York. It is marked "mountain rhubarb," a designation never seen by the writer before. It is in moderate-sized pieces, clean, sound, and well trimmed. When bored in the centre the odor is aromatic, and the color and texture is good and pretty uniform, but it is very perceptibly damp.* One of the cases of this same lot,

*Since the last meeting the writer has had made, by Messrs. Geo. Tieman & Co., surgical instrument makers, on the corner of Chatham and Chambers streets, New York, a simple little instrument for boring rhubarb. This instrument, which is here shown, is in imitation of that used by the Russian inspectors, or at least makes a similar depression,

very similar to that here shown, was bought by the writer about a month ago, and every piece critically bored and examined. The entire neat weight was 90 lbs. This yielded 79½ lbs. of perfectly sound pieces free from serious discoloration, and of uniform good quality. Of this 19 lbs. was separated, of small, good-shaped, fine-looking lumps, which, though no better than the remaining 60½ lbs., might be considered carefully selected rhubarb, well adapted to sale in the lump, for the distinct purpose of chewing in dyspepsia, etc. The discolored and unsound lumps and borings weighed 10 lbs. 5 oz. These lumps were all split open by the lever described last year, and the dark and unsound portions removed by a gouge. The yield of good sound rhubarb by this was 7 lbs. 5 oz., the remaining 3 lbs. being considered quite worthless. The total yield from the 90 lbs. was therefore 89 lbs. 13 oz., or 86 lbs. 13 oz. of good rhubarb. The 67 lbs. 13 oz. was powdered with a loss of nearly 5½ per cent. from dampness, and the powder is exhibited in the sample No. 1, previously referred to. This powder is considered entirely unobjectionable, and that such a powder when seen separately is scarcely distinguishable from one of half the value, should be a lesson to all dealers in drugs.

The second small half-piculcase is sent to the Association by Messrs. Dodge & Olcott, of New York, and, like the other, is one of a lot of eight or ten cases. This is even brighter and handsomer in external appearance than the first; is of the flat variety, and presents an exceedingly nice appearance, well peeled and uniform. Upon boring it is found sensibly dryer than the first, equally uniform in color and texture, and about equally sound and free from discoloration. A lump here and there is seen to have one or two worm holes, but the chief and most important distinction between this and the first case is that it is less aromatic,—a point in which both are deficient. The size and shape of the pieces in this case are considered rather more saleable than those of the other, and it has been preferred by brokers as better adapted to being made into Turkey rhubarb.

and one the sloping sides of which permit a critical inspection of the piece bored. The boring should penetrate to the centre of the piece, when, with a little experience, it is more satisfactory than breaking, is more neat and cleanly, and damages the pieces less.

The price of both these lots is $2.50 currency,—a price at which no one should complain, for the quality is unexceptionable. Another lot was seen in the New York market, belonging to Messrs. Dix & Morris, and a fourth in the hands of Messrs. B. W. Bull & Co., neither of which was much below these in intrinsic value, though less showy.

The third case exhibited belongs to the writer, and is part of a lot of five cases imported by Messrs. Dodge & Olcott. This is not quite as fine in appearance as either of the others, though well peeled, uniform, and good looking. An occasional piece shows a worm hole or two, on close inspection, and the lumps are decidedly heavier. Upon boring, the color is uniform and good, but darker than the others, and the texture is more compact. It is also less dry, but the conspicuous difference is in the odor, which is much more aromatic and finer. Every lump in the case has been inspected by the writer, and it is separated into three grades of quality. The best portion, and that which is considered as select, contains 81 lbs. The second portion, which is intrinsically nearly, if not quite as good, weighs 44 lbs. The dark pieces, which are considered worthless, weigh 3 lbs. 14 oz., and the borings weigh 3 lbs., making 131 lbs. 14 oz. in all. This is considered the best of the three cases. This also cost $2.50 per pound, but has about two days' labor upon it as it now stands. All three of these cases are damp, and the latter the most so, which accounts for the darkness of color. As they dry, the color will improve. It is a curious circumstance in connection with the rhubarb market of the past year, that much of it is so damp, and loses so much in powdering. As the curing and drying process at the place of production must necessarily be a slow one, this is taken as evidence of its being hurried into market a little prematurely. It is highly probable, too, that this dampness invites the attack of worms, as it is very unusual to see very dry rhubarb with worm holes. The difference in the loss by powdering, from dampness, is so remarkable that it may be interesting to give some statistics upon this point. The dampness varies in different packages, but appears to be greatest in the lower grades.

In 1866, the writer powdered fourteen parcels or chests of rhubarb, the lowest or minimum loss being 0·82 per cent., and

the highest or maximum loss 3·4 per cent. The average loss for the year on the fourteen cases was 2·08 per cent.

In 1867, fifteen lots were powdered. Minimum loss 0·09 per cent., maximum loss 2·15 per cent., average for the year 0·97 per cent.

In 1868, the first parcel of this damp rhubarb was met with. It was powdered for a Boston house, and lost 8·91 per cent.,—a loss never before met with, and giving the writer much uneasiness and trouble to account for it, fearing some carelessness or some mistake in the mills. Leaving this out, nine parcels were powdered in 1868, the minimum loss being 0·58 and the maximum 2·99 per cent., and the average loss for the year 1·27 per cent.

Thus far in 1869 ten parcels have been powdered, five of which were old rhubarb, and five of this damp kind. In the first five the minimum loss was 0·62, the maximum 1·76, and the average loss 1·24 per cent. In the last five the minimum loss was 5·5, the maximum 10·32, and the mean or average 7·91 per cent. The rhubarb thus powdered embraces all grades of quality, except perhaps the very lowest; for the writer cannot, or rather has not refused to powder for druggists all grades of goods that are not positively worthless, provided he be not asked to do any "mixing" or "bringing up color," or other forms of positive adulteration. Yet it may be usefully asked in this connection what would be the moral difference between powdering a high grade of rhubarb (or any other drug) mixed with 10 per cent. of English or American inert rhubarb, and powdering a lower grade of damaged or worm-eaten not pure, the intrinsic value being 10, or say even 20 per cent. below the first. The powder of the last is as bad, or even worse than the powder of the first, and therefore the harm which may be done by a bad medicine may award the preference to a fraudulent, or rather to the *more* fraudulent practice; because both are fraudulent, if not equally so. And all concerned share in the fraud.

This unusual dampness in rhubarb at this time leads the writer to the inference that it has been hurried into the market at an earlier stage of the curing process than is usual. We, or rather this writer knows very little about rhubarb, and has to find his way by inferences and deductions. The varieties of the plant

yielding it; the place and mode of collecting or cultivating, or whether cultivated or not; the proper age or natural condition of the root when taken; the methods of preparing, drying, and putting up for commerce,—are all unknown to the writer. But by cross-examination of the drug as met with for a series of years certain testimony is obtained, which may or may not be evidence. The difference in form, size, shape and structure lead to the inference that many varieties of the plant yield the drug. And the commercial channels through which it comes indicate considerable differences in locality, climate, etc. The age at which it is taken from the ground must be far from uniform, as the shrivelled, mucilaginous, slender pieces are evidently young and succulent roots, whilst those which are very light-colored and gritty, and which contain little soluble matter, are as evidently too old. Maturity and average excellence must lie between these extremes. When taken from the ground the bark of the root is more or less perfectly removed and the ends and angles cut off, and a hole is pierced, not bored, through one end of each piece. Through these holes a string prepared with some kind of tar is passed, and the pieces thus threaded on the prepared string are hung up to dry, probably in the sun. As the drying progresses, the roots contract more or less in proportion to their structure and age. By this contraction the string is grasped more or less tightly, and the tar squeezed out of it into the root; and the quantity of tar on the string, and the amount of pressure exerted to compress this into the root, are indicated by the greater or less extent of blackened root around the string hole or canal. It is comparatively rare to find a shrivelled piece of root that has lost much in size, as indicated by its shape, which has not the piece of string tightly grasped in the canal. But it is much more common to find the older, light-colored gritty pieces, which are not, or are but slightly shrivelled, free from all vestige of the string except the canal and the discoloration. Indeed, it may be said that as a rule the mature pieces rarely contain the string; or if it be in, it is so loose that it may be pulled out. When the string has been tarred too much, it causes a kind of rotting process to occur around it; or when it is tarred too little, by the absorption and holding of water, it seems to produce the same

rotting effect, and these often extend from the canal to the centre of the root, and start the discoloration, which is probably a kind of fermentation, there. This tarring of the string appears to have two objects or effects: first to keep off insects by the azymotic influence; and next to preserve the string from rotting and from holding moisture during the long process of drying. When dry, those pieces which will not slip off the string have the string cut, and in the final trimming of the root before separating into grades for packing, the string is cut off close. Now if the drying process be interrupted very much too soon, only the external shell of root becomes dry, and this shell will be of various thickness, proportionate to the size of the root and the time of drying; and the roots when thrown together in a mass in this condition will "heat," and undergo a fermentation that will destroy or damage the portions which have moisture enough for the process of fermentation. Hence the rottenness and discoloration of so many of the pieces which appear well on the surface. This rotten discolored portion is commonly much less compact than the shell, and is very deceptive in its apparent weight value. Hence a rhubarb which has a sound shell of not over one-fourth its volume will, when dry, give a powder of fine appearance, because this one-fourth in volume of compact texture may represent three-fourths of the total weight, the fermentation or "heating" having carried off the remainder in the form of gases and vapors. And the portion left, which yields still the fine beautiful powder in such a large proportion to the whole, would be comparatively good and valuable but for the circumstance that the fermentation within, and this percolation by the resulting gases and vapors, so changes its medicinal properties, and so drives off the aromatic properties, as to render a handsome looking powder comparatively worthless. The peculiar odors of medicinal drugs are probably their most characteristic properties, and these are so easily dissipated or diminished, not only by fermentations, but by faulty processes of drying and preservation, that they become important indications of value, and particularly so in such delicate sensitive substances as rhubarb.

The drug hurried into chests at the place of production, or

earer the seaports, before it is dry, or while still fermenting, nd in this condition enclosed, not hermetically, but almost so, sheet lead, and placed in the hold of a vessel, suffers another ost trying ordeal. Every change of temperature precipitates r absorbs moisture within the sheet lead, and thus the hurtful eactions, which might have but just begun or be nearly ended, re stimulated to renewed energy, so that insects are produced nd multiplied upon every possible scale from slight damage up total destruction. There is one other difference in commercial hubarb which may be worth noticing. At times the surface of ne lumps looks dry and clean, but of a rather bright brownish-ellow color, except where the bark has escaped removal. In ther lots this same condition of freedom from dust or powder xists with a faded appearance, as though the lumps had been ashed, or at least rinsed off and dried. In other lots, again, he surface is covered with bright yellow powder, which is either o well rubbed on, or so well obtained by attrition of the pieces pon each other, as to cover even the black patches of bark. Why all is not prepared alike it is difficult to understand, but ne thing has been observed, and that is that rarely, if ever, the good grades are found without this powdered surface, while low grades are sometimes without and sometimes with.

In conclusion, it may be remarked that it is still unknown what becomes of the old-fashioned rhubarb which ten years ago reached the market through the Russian Government sales. It s never seen either alone or mixed with other grades in any proportion; and the attempts to imitate it are rarely successful n deceiving any one except the consumer.

It is suggested that the samples of powdered rhubarb presented herewith be referred, with the rhubarb not powdered, to the Committee on Specimens.

Brooklyn, Sept. 2, 1869.

COLLODION.*

BY FREDERICK C. MUSSGILLER, OF BROOKLYN.

The officinal collodion is liable to at least two practical objections. The first is that it contains too little gun-cotton. And the second is that for surgical purposes, whether used of the present strength or stronger, the film contracts strongly, and is very liable to crack and present sharp edges, which irritate the parts to which it is applied, and favor the separation of the film at an earlier period than that at which it separates by reason of the cutaneous transpiration beneath it. The cantharidal collodion is also liable to the same objections, besides not containing cantharides enough to secure the effect for which it is used. The addition of more gun-cotton, of course, remedies the first objection; and the addition of a small proportion of castor oil or glycerin, or other non-drying substances, as is well known, render the film flexible and tough; but how much of either is proper or necessary, and how they are to be used, has not been well or accurately determined. In view of the approaching revision of the Pharmacopœia, a series of experiments upon the points here raised were undertaken, and the writer offers the following formula to the Association as a voluntary contribution:

Collodion is applied to two distinct uses in surgery. In one, its contractile force is rendered available in the compression of small tumors, etc.; in the other, it is used as a protecting coat or covering to prevent mechanical irritation and access of the air. The first use of course requires that the film should contract as much as possible, whilst in the second, and by far the most general use, the contraction is objectionable. The recent British Pharmacopœia meets this difficulty by providing two kinds, one called simply "Collodium," the other "Collodium Flexile," the latter containing Canada balsam and castor oil. The Paris Codex has only one kind, and uses castor oil alone. Glycerin, where properly used, is considered by some writers better than either, but it cannot be used as quoted in the U. S. Dispensatory, from M. M. Cap and Garot. It is suggested that the U. S. Pharmacopœia supply two kinds, the flexible to be

* This paper having been prepared in the Laboratory of E. R. Squibb, and under his superintendence and direction, by Mr. Mussgiller, who was then one of his assistants, is reproduced here with his paper.

called simply collodium, but the old kind, which is comparatively little needed, to be called collodium contrahens. The first may be prepared as follows:

Take of pyroxylin or gun-cotton, eighty-six grains.

Castor oil, eighty-six grains (or glycerin, sixty grains.)

Stronger ether, three and a half fluidounces, or two troy-ounces and two hundred and six grains.

Stronger alcohol, one fluidounce, or three hundred and seventy-six grains.

Dissolve the castor oil (or the glycerin) in the stronger alcohol, add the ether to the solution and dissolve the gun-cotton in the mixture by shaking. Should it contain visible floating particles, set it aside for a few days, and decant the collodion from the sediment. Collodion is a nearly colorless opalescent liquid, of a syrupy consistence, very liable to loss by evaporation, and dangerously inflammable. A small portion, say twenty or thirty grains, weighed in a counterpoised corked vial, and then exposed to spontaneous evaporation by removing the cork and laying the vial on its side till dry, loses ninety-one per cent. of its weight in four hours.

In comparing the formulas of some of the modern Pharmacopœias, no two were found alike, and the following are the percentages by weight of pyroxylin:

The U. S. Pharmacopœia gives		3·50	per cent.
" British	"	2·60	"
" French	"	7·00	"
" Prussian	"	3·	"
And the formula above given		5·	"

of pyroxylin. Specimens of the present officinal U. S. Pharmacopœia Collodion, of the British "Collodium," and "Collodium Flexile," of the French, of the Prussian, and of the formula here proposed, are presented herewith, as well as specimens showing the effect of larger proportions of glycerin. All have been tried by the writer upon himself, and that which appears to yield the most durable and flexible film in summer weather is the collodion containing five per cent. each of gun-cotton and castor oil. It is observed that the smaller proportion of gun-cotton renders the film more contractile, and therefore for this variety the small proportion of the British Pharmacopœia

is recommended. In the writer's practice the cantharidal collodion has for some years past been increased, in the proportion of cantharides used, by ten per cent., but it is doubted whether this be a sufficient increase. It should always be made flexible or non-contractile, and therefore requires more gun-cotton. Specimens of both proportions are presented herewith:

The addition of a proportion of phenols, or carbolic acid, to the flexible collodion proposed, will often be found very useful and important. From one to ten per cent. of the coal-tar creasote, or impure carbolic acid, may be conveniently added, and this mixture yields a film well calculated to replace many of the more complex and clumsy "carbolic acid plasters" in use.

List of Samples of Collodion.

Number.	Percentage of Gun-Cotton.	Percentage of Glycerin.	Percentage of Castor Oil.	Percentage of Canada Balsam.	Percentage of Cantharides.	Percentage of impure Carb. Acid.	Remarks.
1	3·50						Strictly officinal.
2	3·99						10 p. c. increase.
3	4·4	2·48					Clear.
4	4·4	3·					Slightly cloudy.
5	4·4	3·7					Cloudy.
6	4·4	4·4					Slightly milky.
7	4·4	4·62					Milky.
8	4·93	4·93					Milky.
9	3·						Prussian Pharmacopœia.
10	2·6						British Pharmacopœia.
11	2·6		2·65	5·45			British Flexile.
12	7·00		7·00				Paris Codex.
13	5·		5·				Best flexible film.
14	4·4		4·4				
15	7·53	7·53					Milky and dense.
16	7·53	5·					Slightly milky.
17	7·53	3·76					Clear.
18	1·9				½ grain to a minim.		Strictly officinal.
19	3·				6-10 grain to a minim.		10 p. c. Canth. more.
20	5·		5·			1	Phenated.
21	5·		5·			2	"

It is suggested that all these specimens be referred to the Committee on Specimens for report.

Brooklyn, Sept. 2d, 1869.

LIQUOR OPII COMPOSITUS. (COMPOUND SOLUTION OF OPIUM.)

By Edward R. Squibb, M.D.

In the early part of 1859 the writer of this note completed a design previously formed and less definitely executed, of offering for general medical use a liquid preparation containing only the useful anodyne and hypnotic constituents of opium, and of uniform strength.

The design originated in a desire to improve upon the advantages of the "opium titré" or assayed opium of French pharmacy, and to imitate, with improvement, if might be, some of the advantages claimed for the nostrums known as Battley's "liquor opii sedativus," and McMunn's "elixir of opium."

Such a preparation was made, and, under the name of liquor opii compositus, was placed in the hands of several physicians who were supposed to be intelligent close observers, and who had been long familiar with the various preparations of opium and their effects in use. These trials, though not very numerous, resulted in the main so favorably that, after continuing them through the year 1859, a paper was prepared upon "opium as a therapeutic agent," containing a minutely detailed practical working formula for the preparation of liquor opii compositus, and strongly recommending it for trial in general use, and for introduction into the then approaching revision of the U. S. Pharmacopœia, if it should sustain its promised useful character. This paper was published in this Journal for March, 1860, and may be found in Vol. VIII of the third series (Vol. 32, whole number), at pages 115 and 120 et seq. The preparation was not advertised nor pushed in any way, either publicly or privately, but was simply announced for sale on the writer's price lists, with a recommendation for trial, and was allowed to make its own reputation, and seek its own level of value. In 1862 it had been much more extensively tried, but was refused admission to the Pharmacopœia by the Committee of Revision,—the Committee adopting instead of it the present formula for tinctura opii deodorata. With this latter preparation it was at once put in fair open competition, the two preparations being offered side

by side, with a fair statement that one had been rejected and the other adopted by officinal authority, and with the no inconsiderable inducement of 20 per cent. difference in price in favor of the officinal preparation. Beside, the officinal tinctura opii deodorata was always made from assayed opium, and was uniform in strength with the liquor opii compositus, with which it was placed in competition. The Pharmacopœia does not require the tinctura opii deodorata to be made by assay, but this was done to secure the competition against any disadvantage through want of uniformity in strength. The liquor opii compositus is always made of the strength indicated in the officinal tinctura opii, or laudanum, if the laudanum be made of good powdered opium as it should be. Such laudanum always contains at least four grains of morphia, which is equivalent to about five grains of crystallized sulphate of morphia in each fluidounce. Since 1867 they have been placed side by side upon all the price lists issued by the writer, and until recently with notes fairly setting forth the characteristic points of each. Diligent inquiries have been made in regard to the comparative value of the preparations, and whenever these inquiries have been answered the preference has been given to the compound solution. The sale of both has increased steadily year after year, but the sale of the compound solution has increased much more rapidly than that of the deodorized tincture, and is now more than ten times greater. The regular and steady increase in the demand for the compound solution during the past eleven years having now increased its production in the writer's hands to over eight hundred pounds a year; and the probability that many pharmacists make it for themselves, induces him to undertake a revision of the formula, in order to remove some objections to the present formula, which appear to have been established on good grounds.

The first and principal objection to the present formula is that the odor and taste of ether is disagreeable to most persons, and to many nauseating and hurtful. The increasing use of ether as an anæsthetic, and the nausea, vomiting, and natural disgust produced by it when so used, and the frequent necessity for an anodyne after anæsthesia, renders it of some importance that the anodyne should not contain the agent which has excited the

nausea and disgust, but should rather contain some corrective or corrigent to this tendency to nausea. The compound spirit of ether was used in the preparation chiefly as a preservative agent, to prevent change in the solution, but also to have whatever effect it might, in so small a proportion (3 minims in 24), in favorably modifying the action of the opiate. Dr. Physick and many other excellent authorities had the habit of associating the true Hoffman's anodyne (made with heavy oil of wine) with their opiates, and the habit was confirmed by their observation of the effects obtained. It, however, could not be introduced into the compound solution of opium in sufficient quantity to be very effective, even as an adjuvant, and it is therefore highly probable that its chief agency has been that of a preservative against change in the preparation, and therefore that it might be replaced by some other preserving agent, even if objectionable only in a small proportion of the cases in which it is used, without altering the intrinsic character or value of the preparation.

The second objection to the compound solution of opium was that when long kept in a bottle only partially full, particularly when thus kept in warm climates, or in a warm place in a dispenser's store, it would gradually lose the odor of ether, and assume that of acetic ether. This change was rarely completed in less than two or three years, but numerous instances have been met with where every trace of both ether and heavy oil of wine odor had disappeared. Such specimens, when carefully tried, were found to possess their full original anodyne and hypnotic value, and gave to some good observers the impression or conviction that the acetic ether thus spontaneously generated was an improvement upon that which it replaced. Through watching this suggestion during the past two years, and reading somewhat upon the uses of acetic ether in continental Europe, where it is occasionally prescribed, the conclusion has been reached that even in small quantities it has a pleasant stimulant effect, and that its odor and taste are refreshing and agreeable to a large majority of people, or indeed to almost all. And finally, that if medicinal at all, it is so to nervous susceptible persons, and always in the direction of favorably modifying the well known disagreeable effects of opiates.

These are the two objections that are to be met, and, if possible, removed, in the revision of the formula for compound solution of opium. The much more forcible objection of a complicated formula, and a multiplicity of detail involving sufficient knowledge and skill to make a correct opium assay, can only be met by the arbitrary opinion or judgment, that he who cannot make such a preparation when all the details are laid down step by step before him, is unfit to be trusted with the dispensing of medicines. It has been made, and skilfully made, by persons of only ordinary pharmaceutical acquirements; and many have refused to make it from the insufficient reason that it involved too much pains and labor. As the essential points or supposed advantages of the preparation,—namely, its uniformity of strength independent of the character or quality of the opium from which it is made, and its freedom from many, if not all of the useless and hurtful constituents of crude opium, whilst retaining the useful constituents in their natural combinations,—as these points are considered essential, are the only objects of the process, and can be attained in no better or more simple way known to the writer, this objection must stand with its full and acknowledged weight against the preparation, with the simple remark that in pharmacy, as in other arts, the best results are not often attainable without commensurate skill and labor.

So much for the revision of the formula, in regard to the objections that have been justly raised against it. The next question that arises is, can it be therapeutically improved? And to this, within the knowledge and judgment of the writer, and of those observant physicians with whom he is in frequent intercourse for counsel and advice, it must be answered that it probably cannot be materially improved in this respect. All opiates, no matter how made or how used, will disagree with many persons, and with some more than others; whilst that opiate which is best borne by some sensitive persons may be badly borne by others. All opiates will constipate almost all persons under all ordinary circumstances, and will produce a nervous reaction proportionate to the initial action, or at least in proportion to the initial over-action or overdosing. Then as all derivatives of opium must in the nature of things partake of the character of opium somewhat

in the relation of cause and effect, it seems most rational to accept together some of those advantages and disadvantages which long observation has shown to be as inseparable as cause and effect, and to seek, rather, by combination with other known agents, or by the subsequent use of corrigents, to remedy the disadvantages in those cases where these are of sufficient importance to demand medication. It is nevertheless now pretty well established, not only that some opiates disagree less than others with sensitive persons, but that some opiates are more generally acceptable and beneficial, and less disturbing than others, and this for reasons of two kinds: First, by excluding some of the disturbing agencies of the opium, and second, by more or less skilful combinations with corrigents. All that can be safely said of the past career of this liquor opii compositus is that it disagrees with a smaller number of sensitive persons, both in its primary and secondary effects, than most other preparations of opium, and that it is more pleasant in its effects than other preparations of opium, or the salts of morphia, in a very considerable proportion of cases, if not generally.

In the deliberate thought and attention given to this preparation during the past few years in connection with its increasing usefulness, it has sometimes seemed doubtful whether the simple depurated watery solution of opium adjusted by assay, and mixed with one-fifth or one-sixth of its weight of alcohol to preserve it from change, would not be the best practical form in which to offer it for therapeutic application. Such a preparation would be called simply liquor opii, and may be made by the formula to be given. This would leave all attempts to modify, correct, or remedy the unpleasant effects of the opiate to the extemporary judgment of the physician, where perhaps they more appropriately belong, because they would be better adapted to individual cases, and would yield a preparation that might be used by hypodermic injection.

This course would be now adopted in the revision of the formula, were it not that the disagreeable taste and smell, and the nauseating effects of opiates, are so objectionable to a large proportion of patients, and that physicians in general are not skilful in the use of corrigents, and therefore not unfrequently fall, or

are led into practices which, to say the least, do not always tend to improve the therapeutic action of their remedies,—the use of sugar-coated pills, for example. It is therefore mainly to cover the taste and odor of the opiate, to render it more acceptable in delicate conditions of the stomach, and to give it a direction or tendency opposite to that of nausea, that a small proportion of acetic ether and purified chloroform are now introduced into it instead of the compound spirit of ether. If these new ingredients have any important medicinal effect, it will surely be in a direction opposite to the natural nauseating and depressing effects of the opiate, and therefore they are safe, with a reasonable chance of being useful.

Such good effects may well be expected from chloroform, and might be secured if the chloroform could be well introduced in larger proportion, for the following principal reasons, which have led the writer to use it in the formula. Soon after the internal use of chloroform was practised it was found to be sedative and hypnotic, or to have very much the same therapeutic effects now attributed to chloral, and was by some physicians associated with opiates, and particularly with the salts of morphia, with very good results in favorably modifying the action, and controlling the after effects, as nausea, anorexia, headache, depression, etc. It was, however, practically very difficult to get the two substances in solution together within the limits of an ordinary dose without inconvenience from the pungency of the chloroform, and the best results were obtained from the clumsy and inconvenient plan of mixing them with thick syrup or honey. The burning effect of the chloroform upon the mouth, fauces and stomach, though of short duration, was objectionable, and thus the association of the two substances, though proved to be eminently advantageous, never came into general use. It was, however, sufficiently used and appreciated to attract the attention of quackery, and the nostrum called "chlorodyne" was the result. It is often wonderful to see how squeamish and critical physicians and patients are to the disadvantages and inconveniences of legitimate extemporaneous mixtures, which, when served to them in the plausible tone of quackery, lose all their disadvantages, and come out afresh with sensational novelty. Chloroform

associated with morphia salts forms the therapeutic basis of the nostrum "chlorodyne," and the extraordinarily incongruous and irrational mixture of molasses, peppermint, capsicum, cannabis, hydrocyanic acid, perchloric acid, and all the others, if there be more, forms a mere vehicle and blind for the attempted secretion of this old and valuable combination. When, however, it came out in this new dress, at the call of the tin trumpet of quackery, many physicians in the very cities where the extemporaneous use of the combination originated became loud in its praise, and their patients found no difficuly in swallowing it at double price. Through the now waning use of this "chlorodyne" and its numerous imitations, many physicians, and some of them without being yet aware of it, have been again taught, on a larger scale, that there is a value in the association of chloroform with their opiates for internal use. But to realize the best effects of this combination the chloroform must be in the proportion of about one fluidrachm to the grain of morphia salt, or about eight or ten minims to the ordinary dose. This makes a mixture which, though not too pungent for many uses, is so rarely needed as to be objectionable for common use.

These considerations led the writer to adopt purified chloroform as an ingredient in the new formula for liquor opii compositus, and a series of experiments was undertaken to determine how much chloroform could be introduced, and still have the solubility or miscibility of the preparation in water secured. This proportion was found to be unexpectedly small, even when the solution was made to consist of one-half its volume of alcohol, thereby taking the character of a tincture rather than a solution. One minim in twenty-five, or one-twenty-fifth of its volume, was found to be the maximum quantity of chloroform which would be permanently held in solution when the twenty-five minims of the preparation was dissolved in one fluidrachm of water or more. This solution when made with a fluidrachm of water was considered a little too near to the boundary line of precipitation of the chloroform, and a little too pungent or biting for common use, and therefore the proportion of chloroform was reduced to one minim in thirty minims of the finished preparation, and the whole formula as finally determined upon was as follows :

Depurated, assayed solution of opium, (Equal to one-third of a grain of sulphate of morphia.)	14 minims,
Stronger alcohol,	13 minims.
Purified chloroform,	1 minim.
Acetic ether, s. g. 0·880,	2 minims.
Maximum dose,	30 minims.

In the very full dose of 25 minims there will be,—

Of the opium solution (equal to about one-quarter of a grain of sulphate of morphia),	11·67 minims,
Stronger alcohol,	10·83 "
Purified chloroform,	·83 "
Acetic ether,	1·67 "
	25·00 "

In the average adult dose of 20 minims there will be,—

Of opium solution (equal to about one-fifth of a grain of sulphate of morphia),	9·33 minims,
Stronger alcohol,	8·67 "
Purified chloroform,	·67 "
Acetic ether,	1·33 "
	20·00 "

This preparation, when dropped from a common one-ounce vial, gives about eight hundred and twelve drops to the fluidounce;* or about one and seven-tenths (1·7 drops) drops to the minim. Therefore thirty-four drops is about equal to twenty minims. Thirty drops is perhaps the more common usage as the ordinary adult dose, while twenty-five drops is often sufficient for adult females, or even adult males who are susceptible to opiates.

It is occasionally required in double, or even in three times the maximum dose as above given, and then will of course con-

* The first two fluidrachms dropped from full bottle, 190 drops.
The second two " 176 "
The third two " 201 "
The fourth two " 246 "

tain twice or three times the quantities, equal to two-thirds or one and one-third grains of sulphate of morphia. These doses are, however, under ordinary circumstances poisonous; and it is always best with this, as with all other opiates, to give them in judiciously timed divided doses until the object or indication is *nearly* accomplished, and then stop.

When opiates are given incautiously in large doses, they often seem to meet the indications to their use with a shock or concussion, overwhelming all the powers; and in proportion as this impression is profound and continued, and in proportion as it over-reaches the desired object, in the same proportion is the subsequent reaction, producing depression, anorexia, nausea, headache, constipation, etc. Now in medicine, as in mechanics, it would be irrational to expect to control a reaction independent of control of the initial action, and therefore opiates are not justly chargeable with the results of this not uncommon misuse. On the other hand, however, it is necessary to avoid the very small doses which serve only to stimulate and excite the sensorium; and therefore no direction for dosing can be given that will be more than usefully suggestive to common sense and good judgment, acting upon a clear conception of just what is required to be done, and how easy it is to overdo this.

The plea for assayed preparations in medicine and pharmacy, in order to attain some degree of accuracy and uniformity in therapeutic practice and results, is well illustrated in the instance of opium. It is well understood that hardly any two lumps in a case of ordinary opium yield the same proportion of the useful alkaloids, and that the different lumps have as great a variation as from five per cent. in some, to ten or eleven per cent. in others. It is also well known that by the escape of moisture the proportion of alkaloids is constantly varying until the opium is quite dry. It is also well known that opium is *not* the concrete juice obtained by incision from the unripe heads of Papaver somniferum, but is a varying proportion of this juice mixed with a heterogenous mass of foreign matter in a more or less solid condition, and that the productive or unproductive seasons, and the variations and speculations in price, have an influence in the yield of the alkaloids and also in the amount of foreign matters

admixed. If there be any who believe that the opium of the markets is wholly, or even in greater part, constituted of the juice of the capsule obtained by incision as described by the books, it is only necessary for them to divide the whole number of the population of the part of Asia Minor which produces opium, into the number of pounds which constitutes a crop, to prove that it is impossible for any such number of people to collect any such quantities in any such way. It is also known that there are different grades of quality in opium, which *may* be judged by the appearance; and different grades of quality which *cannot* be judged by the appearance, no matter how expert the judge may be. Crude opium, to be officinal, must contain "at least 7 per cent. of morphia." Then this crude opium in drying loses an average of 20 per cent. of moisture. Therefore dried or powdered opium made from crude opium which is just within the officinal minimum limit and no better, will contain 8·75 per cent. of morphia.

The writer has recently seen a small lot of opium that, when dried, yielded a powder containing nearly 15 per cent. of morphia, and knows from actual observation that by appearance, on very critical inspection, it could not be distinguished from another lot which, under the same management, yielded only 12 per cent.; and yet there was only a difference of about $1.50 or less per pound in the price.

Beside this, opium being a mixture made up for price and profit at the place of production, and being of limited production, but of almost unlimited demand, has of late years assumed the character of a manufacture rather than a natural product; and its practical standing in the markets to-day in regard to its dilutions and adulterations at the place of original production is not very different from that of woolen goods in regard to shoddy. Hence the better grades of opium, like the better grades of woolens, are produced in comparatively small quantities for the comparatively small demand at higher prices, and these grades, naturally enough, fall into the hands of the makers of morphia salts, where intrinsic value is closely studied in the interests of pecuniary gain.

Again, so localized and so limited is the production of the

valuable varieties of opium, and so wide-spread and insatiable the demand for opium,—four-fifths of it, at least, being probably consumed as an intoxicant,—that a "ring" of speculators could, and did form a "pool" last year, and so controlled the product and the markets as to run the price up to more than double, and during one period to about three times the ordinary cost, and to maintain such prices for nearly the entire crop, with such signal pecuniary success as to warrant the prediction of future similar speculations. Indeed, at this moment opium is again on the rise, with the possibility, if not the probability, that it is again "cornered" by a "ring." All this will probably have the very natural effect of stimulating the production; but the production will be stimulated in two ways: not only to cultivate more poppies and make more juice, but also to make more opium from the juice,—that is, debase it still farther in the manufacture, just as wool is made to go farther when the supply is short of the demand, and the price consequently high.

Now if these statements and deductions be true, and have any value in or any bearing upon medicine and pharmacy, they indicate one thing, and teach one lesson which is optional with us to learn or not, and that is, that the comparatively small portion of opium which is used in legitimate medicine and pharmacy should be used only by assay; and that such opium and its preparations should be, by assay, brought to a definite uniform medicinal strength. But from the variation in the various lumps of opium of the same case it is manifestly impossible, or at least impracticable, to assay it with useful accuracy in the crude moist condition. It must be either dried and powdered, and the powder be assayed, or it must be extracted, and the extract be assayed. Opium, then, is an exception to the rule which teaches all careful physicians and pharmacists never to buy drugs in powder. And yet, unless assayed, it is the most unsafe of all drugs to buy in powder. No plan is so good or so safe as to dry and powder the opium, and then assay the powder by extracting that; because, if carefully dried and powdered without too much heat, the quantity and quality of the useful alkaloids are not materially altered, whilst a large proportion of the useless and embarrassing extractive matter is rendered insoluble in the dry-

ing and powdering process. Beside, it is only by drying and powdering that a homegeneous product is obtained, every part of each package of which represents the whole. If a physician or pharmacist buys a pound of powdered opium, the assaying of 150 grains or so of this will indicate the quality of the whole. But if he buys a lump of crude opium and assays any part, or even two or three parts of it, the assay may not, and in all probability will not, represent the whole. He may make the whole lump into a strong tincture or solution by extracting it, and assay a portion of this solution or tincture, with the same ultimate result, but the assay is then less simple and more difficult.

This then is the chief, though not the only merit claimed for this liquor opii compositus, that it is made by assay, and therefore of practically uniform strength, entirely independent of the quality of the opium from which it is made.

This process of assay is not a highly critical scientific process which gives account of every tenth, or even every quarter of a per cent. of the useful alkaloids contained in the opium, but the aim is simply to come within one per cent., or thereabout, of the medicinal value and efficacy of different parcels of opium in its power to produce sedation, and to relieve pain in disease. Whilst a critical morphiometrical assay, or an analysis of opium, is one of the most difficult processes within the writer's knowledge, and probably has never been once attained in his thirty years' experience, a practically useful and sufficient process, by various methods, is so simple and easy as to be within the capacity of any person who is at all fit to be trusted with the handling of potent agents in their application to medicine. The first steps of that simple process of assay which is preferred by the writer are those by which the solution of opium which characterizes this liquor opii compositus is depurated, or freed from extraneous matters, whether these be hurtful or simply useless. And this is the second and only other important merit claimed for the preparation. By rejecting much of the resinous, gummy, nauseous, and otherwise hurtful constituents of the heterogeneous mixture called opium, a real practical advantage is obtained; whilst the retaining the useful alkaloids in their *natural combi-*

nations, associated with only that part of the coloring matter and extractive which, like the useful alkaloids, are soluble in both water and alcohol, and insoluble in ether, must be considered as important advantages. Hitherto the preparation has been an aqueous one, or at least contained only one-eighth of its volume of the mixture of alcohol, ether, and heavy oil of wine. But it is now so doubtful whether there is any real advantage in this, that the point is abandoned in order to secure the permanent solution of the chloroform by largely increasing the proportion of alcohol. Hereafter the preparation will contain about half its volume of stronger alcohol,—that is, will be of about the same alcoholic strength as the officinal tincture of opium. This materially disturbs and diminishes the appropriateness of the name, since "liquor" is commonly accepted to mean an aqueous solution, whilst "tincture" is as commonly accepted to mean an alcoholic solution. All good authorities, however, apply the word "tincture" in a technical sense to solutions where the solvent is only half alcohol, or even less. The name, however, cannot now be wisely changed, and the only circumstance which supports its equivocal appropriateness is that the large proportion of alcohol is not present as a solvent of the opium products, nor as a vehicle, since the water performs both these parts, but merely as a preservative agent, and as a solvent and protector for the chloroform and acetic ether; and it therefore may be construed to enter into the nomenclature with its more intimate associates under the word "compositus," as one of the compounding ingredients.

The preparation may perhaps not unfairly be criticised as unstable, from the great volatility of both the acetic ether and chloroform, since these will have a tendency constantly to escape from it during use. But when it is remembered that these are not essential to its primary medicinal efficacy, and that if entirely evaporated out the medicine would be but one-tenth stronger, the criticism will not have much force. A much more forcible objection to the preparation is often made in regard to its costliness. This objection cannot be satisfactorily met, and need not be attempted, since those who do not recognize the necessity or the value of the time, labor and skill involved in it, and are not

willing to pay a liberal profit upon these as invested in it, of course should not make or use it,—and will not, no matter what might be said in attempted justification of the cost. Upon an average it will represent about one-tenth of its weight of powdered opium; and it will not remunerate the maker unless it yields him about two and a half or three times the cost of that proportion of the best powdered opium.

It happens that the useful constituents of opium are all soluble in both water and alcohol, and are insoluble in ether; whilst a very large portion of the useless and hurtful constituents are insoluble either in water or in alcohol, or when soluble in both are also soluble in ether. Taking advantage of these circumstances the opium is subjected to the action of these solvents in succession, the successive residues being rejected, and the resulting extract is diluted to form the depurated solution. A small portion of this is assayed, and the result of the assay is applied, by multiplication to the whole, and this is then diluted to a definite degree by the addition of the other ingredients and water. Merely to state this general plan or outline of the process without the detail necessary to put it in practice would be of no use, and would really defeat the object of this paper, since that object is not more to convince the reader of the necessity for such a preparation, than to teach him a good practical way of making it for himself, and perhaps, also, to offer what may be a useful lesson in practical pharmacy. Beside,where broad and apparently exaggerated statements are made in any particular interest there is always room for suspicion of advertising; and the cause for suspicion is strengthened when any reserve can be detected, or when any link or point is missing in what should be clear inductive detail. It oftens happens to the writer, in reading what at first sight appears to be a plain open and sufficient detail of a process, to have his suspicion aroused by a missing link or an ambiguous sentence, and therefore the casual reader must excuse any prolixity in detail that may appear unnecessary in giving the following formula and process, since this prolixity, at least, is not caused by having something to conceal.

In giving the formula and process in the U. S. P. officinal weights and measures, nearly or practically accurate equivalents

of the metrical or decimal system of weights and measures are also given because they will be found very convenient to some operators, and because it will serve to familiarize those who read them with the values in this system which is coming into use.

Take of powdered opium, 1543 grains or 100 grammes.
Stronger ether,
Purified chloroform,
Acetic ether,
Stronger alcohol,
Water, of each a sufficient quantity.

Put the powdered opium in a suitable vessel of not less than 25 f℥. or 750 cc. (cc. cubic centimetre,—30 cc. to the f℥.) mix it thoroughly with 20 f℥. or 600 cc. of water, and allow the mixture to macerate over night. The water should be added to the powder in small portions with active stirring until a uniform smooth paste is made. The remainder is then added at once and the whole well stirred. A strong stirrer with a spatula-shaped, or spade-shaped end is almost indispensable to the convenient management of this process throughout. It is better to use this large proportion of water at the outset, because it enables the air to separate easily and well from the powder, and thus much improves the effect of the subsequent percolations ;— because it forms a solution so dilute as not to be precipitated by subsequent admixture with the weaker percolates ; and because it very much facilitates the final exhaustion of the residue. The powder continues to absorb tbe water, and the mixture to diminish in volume for several hours after the mixing.

Take two 9 inch or No. 22 round filters, fold them separately twice in the usual way for plain filters, and open them in the usual way, with one thickness of paper on one side and three thicknesses on the other. Then introduce one folded filter into the other in such a way that the three thickness side of each shall coincide with the one thickness side of the other. This double filter will then have four thicknesses of paper all round, and its effect in percolation is much improved by conducting off the liquid with uniformity in all directions. Place this double filter not too low down in a 5 inch or 12 centimetre funnel, and wet it well by filling the filter and funnel with water for a few

moments. Empty and drain the funnel and filter and place them on a proper funnel stand. Arrange a 16 f℥ or 480 cc. tared capsule or evaporating dish upon a water bath over a gas flame or other sufficient source of heat, and heat the water in the bath to boiling. Place the funnel stand so that the point of the funnel is over the capsule on the bath, and then having stirred up the opium mixture well, fill the filter from it, very nearly up to its edge, and continue to refill it occasionally until the whole of the mixture has been poured in. When the residue in the filter is drained, measure off 6 f℥. or 180 cc. of water, and rinse the vessel which contained the opium mixture two or three times with small portions of this water, dissolving off, or loosening whatever may have become adherent to the vessel by drying, by means of the stirrer, and pour the rinsings one after another into the top of the residue in the filter. Then keep the filter filled up with the remainder of the water until it has all been poured on, and again drain the residue. Then return the residue from the filter to the vessel in which the mixture was made, by the use of the spade-ended stirrer, leaving the filter as clean as possible, and unbroken in its position. To the residue add 1·67 f℥. or 50 cc. of water, stir it well into a smooth magma, and pour it back into the filter, draining and scraping as much of it out the vessel as practicable. Level it down in the filter, or rather so spread it out against the side of the filter as to leave the surface concave. Then measure off 5 f℥. or 150 cc. of water, and rinse the mixing vessel with small portions of this at a time until the vessel is clean, pouring the successive rinsings into the concave surface of the residue in the filter, and keep the filter filled up with the remainder of the water until it is all poured on. When the residue is drained, the filters and residue may be removed from the funnel, be flattened a little upon a folded newspaper, be put to dry, and when as thoroughly dried as the powdered opium was, may be weighed if desirable. In weighing, the outside filter is to be removed and placed in the weight scale to counterbalance the other one, or, if a nice weighing of the residue be desired, the inside filter must be weighed and the weight marked on it with lead pencil before it is used. The dry residue from good powdered opium weighs

about 736 grains or 47·7 grammes. If it be not desired to weigh the residue it is simply thrown away. If the water bath be well arranged, the evaporation of the percolate will be as rapid as its passage through the filter, even if a pretty thick porcelain dish be used. But if a tinned iron or tin capsule be used, the rate of evaporation will exceed that of the filtration, and the capsule will never get more than half full during the process. Stirring is not needed during the evaporation. The filtration and evaporation require from two to three hours. When the residue is drained and disposed of, set the hot capsule and contents on a scale, weigh them and subtract the tare of the capsule. It will commonly happen that the extract weighs less than the original weight of the powdered opium; if so, add water to it until it weighs the 1543 grains or 100 grammes. Then return the capsule to the water bath and warm the contents with stirring until the whole of the extract which has dried upon the capsule is entirely redissolved. Set the capsule on the scale and again add water to make up the loss by evaporation during this dissolving the extract. Return the capsule to the water bath again, and add to the contents 6 f℥. or 180 cc. of stronger alcohol, stir the mixture till it is uniform, and heat it to boiling. Clean the vessel used for the first mixture of the opium and water, and put into it 12 f℥. or 360 cc. of stronger alcohol, and while stirring this actively pour slowly into it the contents of the capsule. Rinse the capsule with 1 f℥. or 30 cc. of stronger alcohol, and add the rinsings to the main portion. Then cover the vessel to prevent unnecessary loss of alcohol by spontaneous evaporation, set it aside for 12 hours, or over night, and then pour off the clear alcoholic solution from the solid tarry residue. The first portion of alcohol added to the warm watery extract in the capsule is not sufficient to cause a precipitate, but is intended only to so dilute the extract as to render the after precipitation more perfect. The pouring of the contents of the capsule into the alcohol causes an immediate precipitation of a black tarry matter which collects upon the stirrer and vessel; but the solution does not become clear at once. That is, the precipitation is not complete for several hours. The first extraction of the opium by water rejects all the solid mat-

ters, all the resinous matter, much of the narcotin, and in short everything not soluble in water. But the gummy mucilaginous matter and nearly all the coloring matter is soluble in water, and forms a large and embarrassing portion of the watery extract. All the gummy matter and much of the coloring matter are insoluble in strong alcohol, and these constitute the black tarry matter precipitated when the watery extract is diluted and poured into the alcohol. This is the putrescible, fermentable portion of the extract, and its proportion varies greatly with the quality of the opium, being rarely less than 10 or 11 per cent. and rarely greater than 18 per cent. This tarry precipitate contains a small proportion of the useful alkaloids, entangled and carried down with it, and the larger the proportion of this tarry matter the more of the useful alkaloids it will contain. In one instance it was found to contain 0·6 per cent. of the weight of the original opium of morphia. If the precipitation be well managed, however, and particularly if time be valuable, the tarry matter does not contain enough alkaloids to repay the extraction until this residue saved from several operations shall have accumulated. But whether worked singly or accumulated they are dissolved in a little water by warming, the solution diluted with cold water until a filtered portion is no longer made turbid by farther dilution. The solution is then filtered off and the filtrate evaporated on a water bath to the consistence of a very thin extract. About ten times its volume of stronger alcohol is then added gradually, heated to boiling, set aside over night to again precipitate the now clean tarry matter, and then the alcoholic solution is poured off clear, and added to the larger portion of clear alcoholic solution poured off from the first precipitation.

The alcoholic solution is then put into a small tared still and, by means of a water bath, distilled until the alcohol is all over. By a good distillatory apparatus about four-fifths of the alcohol is thus recovered in a more dilute condition than when taken. This, by shaking with about one-eighth of its weight of powdered quick lime and redistilling, is again fit for the same use.

To the extract of opium in the tared still, after distilling off the alcohol, add sufficient water to make up the weight to 1543

grains or 100 grammes, or the original weight of the opium, and warm it in the water bath until the extract is completely dissolved. Then pour this solution into an eight ounce bottle, and rinse the still with a few drops of water, adding the rinsing to the contents of the bottle. When the bottle and contents are cold pour on to the diluted extract 3 f℥. or 90 cc. of stronger ether, stop the bottle well, shake it vigorously, allow it to stand a few moments till the ether separates, and pour this off as closely as is possible with care. Pour on 3 f℥. or 90 cc. more ether, again shake vigorously, and pour it off as closely as possible. Repeat this washing with ether a third time, when the accumulated washings will measure about 8 to 8·5 f℥. or 240 to 255 cc. Put this into the still and distil it to dryness in a water bath with great care, remembering the inflammability of the ether vapor. In this way about 7 f℥. of 210 cc. of the ether may be recovered in a condition to be used again for the same purpose. The residue from the ether washings varies very much in different parcels of opium, but may average about 1 per cent. of the weight of the opium. It is always a mixture of dark oily matter of a nauseous disagreeable odor, and a mass of solid matter which is amorphous or crystalline according to the rate of evaporation and the amount of heat used. By spontaneous evaporation large square tabular crystals are formed. Pour the diluted extract of opium, with the shallow stratum of ether which could not be poured off, from the bottle into the evaporating dish, and by means of the water bath evaporate it to about one half its volume. Put 10 f℥. or 300 cc. of water into the cleansed vessel first used for mixing the opium and water, and pour into this the contents of the evaporating dish, rinsing the dish with a little water, and adding the rinsing to the larger portion. This dilution produces another insoluble precipitate, but one which is loose and flocculent and easily washed on a filter. At this point it is necessary to decide whether the solution is to be made up or finished by weight or by measure, though it may be done by both, the weight answering as a check upon the measure, and *vice versa*. As it is always given by measure, (drops or minims) and has its formula constructed upon minims or volume;—and as different parcels of opium yield the

depurated solution of different densities, it would seem only proper to make it up by measure. But the measures usually accessible are so much less accurate than the weights that they cannot be relied on. Beside, the broad surfaces of measures are not calculated to give that degree of practical accuracy required now a days in adjusting potent medicinal agents. Under these circumstances measures and weights applicable to the average grades of opium will both be given, even at the expense of complication. But the operator who may have a set of weights which agree tolerably among themselves is advised to use these in preference to measures.

Take a tared flask marked in the neck to hold 17 f℥, or 510 cc., (a common French or German half litre flask which is marked low in the neck answers well,) filter the opium solution into it, and wash the filter and residue through with a little water. To this solution add 1574 grains or 102 grammes of stronger alcohol, and, having agitated the mixture, add water until the whole weighs 7870 grains or 510 grammes. This 1574 grains or 102 grammes of alcohol, measured at a temperature of about 17° C. = 62·6° F., measures 4 f℥ and 48 ♏, or 123 cc., but when this is mixed with the watery solution there is a contraction of volume in the mixture equal to about 162 ♏, or 10 cc, and an increase of temperature of 3 or 4° C. = 5·4 or 7·2° F. When the mixture is made up to the 7870 grains or 510 grammes it will measure more than the 17 f℥. or 510 cc., on account of the rise of temperature. When, however, it is cooled to the original temperature at which the liquids were when mixed, the measure will commonly be but a small fraction over or under the measure, as the opium contains more or less extractive soluble in both water and alcohol. This 7870 grains or 510 grammes of solution now contains 20 per cent. of its weight and 30 per cent. of its volume of the stronger alcohol; and is about the density of water,—that is 1 cc. at 17° C. weighs about 1 gramme. It is perfectly clear, and will remain so indefinitely, as it contains alcohol enough to prevent any change even in the warmest weather. It is now ready for assay, and should be kept in a bottle to prevent loss by evaporation while waiting for the result of the assay.

The process of assay consists simply in precipitating the morphia from an aliquot part of this solution by means of ammonia, —drying and weighing the morphia, and applying the result, by multiplication, to the remainder of the solution, so as to ascertain the quantity of morphia which this contains. By this, of course, the farther dilution and adjustment are made. Although this process of assay does not pretend to be critically accurate, yet it will be so in proportion to the care and nicety with which the different steps are followed as now to be described; and whilst without any extraordinary degree of skill it may be so conducted as to indicate within three or four tenths of a per cent. of the morphia value of the opium used, it can hardly be so mismanaged as not to come within one per cent. of the true value.

Take one-seventeenth part, or 463 grains = 30 grammes, or about 1 f℥, =30 cc. of the solution, and put it into a small tared capsule, and set the capsule in a saucer or plate which contains a shallow stratum of, or is about half filled with, water. Then make a mixture of equal parts of officinal water of ammonia and stronger alcohol, and take of this mixture about 77 grains or 5 grammes, or 5 cc., rather more than less,—and add it to the contents of the capsule. Stir the mixture and then cover the capsule with a large beaker or other glass vessel, inverted so that the edge of the beaker or vessel rests on the saucer or plate in the water, and allow the whole to stand at rest during two days or thereabouts. If there be no alcohol added to the water of ammonia, it will sometimes precipitate a portion of the morphia at once, and with it an undue proportion of coloring matter. When diluted with alcohol and in a somewhat alcoholic solution the morphia goes down gradually and slowly in the form of a crystalline crust of a chestnut-brown color, which adheres to the bottom and sides of the capsule. The precipitation is generally complete in 24 hours, often in 12 hours, but is occasionally retarded by unknown causes. It rarely increases after 48 hours, however, and this period is fixed in order to render the result pretty secure. The quantity of ammonia used may vary considerably without materially affecting the result. The quantity indicated is quite enough for opium of the best quality, but

it may be increased one-fourth, or even one-half without much disadvantage. The morphia thus precipitated is not pure, but contains coloring matter enough to give it a light brown, or a chestnut-brown color. The quantity of coloring matter present is, in weight, surprisingly small, and is fully counterbalanced by the small proportion of morphia which refuses to crystallize out. The results are therefore pretty accurate, or at least practically accurate. If the little capsule with the assay be allowed to stand merely covered with paper or a watch-glass for the 48 hours, some of the solution will evaporate away, and form a hard ring of dried extractive matter upon the capsule all round the edge of the liquid, and this would be subsequently weighed as morphia. A pellicle forms on the surface too, and in whole or in part remains in the capsule when the mother liquor is poured off. By the simple device of covering the capsule, and preventing all change of air by a water joint, as described, all this inconvenience is avoided. And beside, the water absorbs the vapor of ammonia as the excess of this precipitant is given off from the solution, and diminishes this excess about as well as if the capsule was left exposed for it to fly off. At the end of the 48 hours the mother-liquor is poured off clean from the adherent crust of morphia which lines the capsule, and the capsule is supported on edge upon some folds of bibulous paper for half an hour to drain. It is then put in a larger capsule on the water bath for an hour to dry, when it is ready for weighing. This weighing should be done on a scale sensitive to about the eighth or the fourth of a grain, and with good weights of course. The capsule and contents are weighed, and the tare or weight of the capsule is subtracted; and the weight of morphia thus ascertained will be in proportion to the quality of the opium. If the powdered opium be within the officinal limit the morphia will weigh not less than 7·72 grains or 0·5 gramme, but it may weigh anywhere between this and say 15·4 grains or 1 gramme. Now as the whole of the solution represented the whole of the opium, and as one-seventeenth of the solution has yielded a quantity of morphia which is now known, it is only necessary to multiply this quantity by 17 in order to know what the whole solution would have yielded if precipitated in this way; or to

multiply it by 16 to know how much morphia the remaining sixteen-seventeenths of the solution contains. Suppose the morphia in the capsule to weigh 11·42 grains or 0·74 gramme. Then 11·42 × 17 = 194·14, and the 1543 grains of powdered opium taken contained 194·14 grains of morphia. Then, as 1543 : 194·14 : : 100 : 12·58 = the percentage of morphia in the opium. Or, it weighs 0·74 gramme. Then 0·74 × 17 = 12·58, and the 100 grammes taken contained 12·58 grammes of morphia. Then, as 100 : 12·58 : : 100 . 12·58 = the percentage of morphia in the powdered opium. But there is only sixteen-seventeenths of the solution remaining, and the other seventeenth part in this supposed case has given 11·42 grains or 0·74 gramme of morphia. Therefore, this quantity multiplied by 16 would give 182·72 grains or 6·04 grammes as the whole quantity of morphia in the remainder of the solution.

This is by no means the only process of assay well adapted to this purpose, and perhaps not the best one. Any of the ordinary morphiometrical processes are good enough, and here, as in most chemical processes, that one is best to which the operator is best educated, and with which he has most experience. A practice of nearly twenty years, growing out of the old Staples process for the extraction of morphia, has led the writer to place a good deal of confidence in this plan; and though it does not pretend to critical accuracy, it is doubtful whether any process that is more complex, more difficult, or more critical, would be adapted to the present condition of pharmacy. Pharmacy should not pretend to be chemistry, and results in this direction which may be far short of chemical accuracy would be an important advance for pharmacy. Simple and easy processes of assay are alone applicable to pharmacy, and the practice of such soon leads to greater accuracy in these first, and then to more accurate processes. This process of assay is easily applicable to powdered opium, and gives results the accuracy of which is proportionate to the dexterity with which it is applied. If a parcel of powdered opium is to be assayed by this process, it is only necessary to take 10 grammes = 154·3 grains, instead of 100 grammes = 1543 grains, and then to divide the whole detail as given by 10. Indeed, the whole detail given is but the writer's process of assay

for opium multiplied by 10, and to him it appears both simple and easy, and has often been verified by extractions of morphia on the large scale by various processes.

Now it is probable that the average yield of morphia from good powdered opium now-a-days will not be over 10·5 to 11 per ct. And the officinal tincture, containing 1·25 troyounces or 600 grains of such opium to the pint, would therefore contain 63 to 66 grains of morphia to the pint. Hence 64 grains of morphia to the pint, or 4 grains to the fluidounce, is assumed as the standard of strength of the officinal tinctura opii, or laudanum.*

This assumed strength for the officinal tincture has always been used as the standard of strength for liquor opii compositus, and will continue to be so.

It is therefore only necessary to divide the number of grains of morphia contained in the remaining sixteen-seventeenths of the depurated solution by 4, in order to obtain the number of fluidounces of 30 cc. each, to which the solution must be made up when finished for use. In the supposed case the 182·72, or say 183 grains, divided by 4, gives 45·75 fluidounces, or 1372 c.c., as the measure for the finished solution.

Now if it be desired to make the simple liquor opii, as suggested on page 73, it is only necessary to add water and alcohol in the quantities indicated by the assay, keeping the proportion of alcohol as small as may be with safety. With one-sixth of its weight of alcohol the preparation would probably keep indefinitely, and could then be used by hypodermic injection.

When the solution is to be made into liquor opii compositus, the proceeding is less simple.

Thirty cubic centimetres or a fluidounce of the preparation, when carefully and accurately made on the basis given on page 75, weighs from 28·95 to 29·05 grammes, or from 446·76 to 448·30 grains, varying to this extent only when made from different parcels of good, and only fair quality powdered opium. Twenty-nine grammes, or four hundred and forty-seven and a

* Morphia ($M_0 = 303$) is to crystallized sulphate of morphia ($M\bar{S}$, $S\bar{O}_3$, $6HO$,=379) as 303 is to 379 or thereabouts, and therefore 4 grains of morphia is about equivalent to 5 grains of crystallized sulphate of morphia.

half grains, is therefore adopted as the standard weight of thirty cubic centimetres, or one fluidounce of a properly made preparation, measured at 17° C. = 62·6 F.

This would indicate the following composition or formula for each 30 c.c. or 1 fluidounce of liquor opii compositus:

Depurated solution of opium containing,—

4 grs. morphia,	14 c.c. = 15·047 grms.,	= 232·17 grs.	= 51·887 p.c.
Stronger alcohol,	13 c.c. = 10·686 "	= 164·91 "	= 36·848 "
Purif. chloroform,	1 c.c. = 1·499 "	= 23·13 "	= 5·169 "
Acetic ether,	2 c.c. = 1·768 "	= 27·29 "	= 6·096 "
	30 c.c. = 29·000 "	= 447·50 "	= 100·000 "

When it shall have been determined by the assay how many fluidounces of the finished preparation the solution will yield, this number of fluidounces is to be multiplied by 447·5, or the number of grains in each fluidounce when finished, and the product will be the weight in grains of the finished preparation. This number of fluidounces multiplied by 164·91, or the number of grains of alcohol in each finished fluidounce, will give the weight in grains of the whole quantity of alcohol required. But a constant quantity of 1574 grains of the alcohol is required in, and has already been added to the watery solution before the assay, and therefore this quantity must be subtracted from the whole quantity required, and the remainder, only, must be taken for the final adjustment. This same number of fluidounces of the finished preparation multiplied by 23·13, or the number of grains of purified chloroform in each finished fluidounce, will give the whole weight in grains of chloroform required. The same number of fluidounces of the finished preparation multiplied by 27·29, or the number of grains of acetic ether in each finished fluidounce, will give the whole weight in grains of acetic ether required. These calculations are really simple, and may be usefully illustrated by continuing the supposed case taken to illustrate the application of the assay.

The 182·72 grains of morphia found to be in the remainder of the solution assayed (the 16 fluidounces or 480 c.c.), divided by 4, gives 45·75 fluidounces or 1372 c.c. as the measure for the finished liquor opii compositus when it shall contain the required

four grains of morphia in each fluidounce. Then 45·75 fluidounces multiplied by 447·5 grains, the weight assumed for each fluidounce of the finished preparation, gives 20473·125 grains, which is the weight to which the solution must be made up in finishing it. Then 47·75 × 164·91 = 7544·63, which is the whole number of grains of alcohol to be contained in the finished preparation. But the constant quantity 1574 grains of alcohol has already been added before the assay, and therefore this must be subtracted from the whole quantity. Then 7544·63—1574 =5970·63, which is the number of grains of alcohol still required to finish the preparation in this supposed case.

This latter quantity is weighed into a tared bottle which will hold the entire finished preparation.

Then 45·75 × 23·13 = 1058·20, which is the number of grains of purified chloroform required. This is weighed in any convenient vessel, and poured into the bottle containing the alcohol. Then 45·75 × 27·29 = 1248·52, which is the number of grains of acetic ether required. This is weighed in the vessel used for the chloroform, and is also poured into the bottle with the alcohol. The bottle is then shaken to mix the contents, the assayed opium solution added, and the bottle again shaken. This remainder of the assayed opium solution weighed 7407 grains, and consisted of 5926·6 grains of watery solution and 1481·4 grains of alcohol. It originally weighed 7870 grains, and consisted of 6296 grains of watery solution and 1574 grains of alcohol, but 463 grains of the mixture (370·4 grains watery and 92·6 grains alcohol) was taken for assay. The bottle now contains of

Assayed opium solution,	7407·00	grains.
Remainder of the alcohol,	5970·63	"
The chloroform,	1058·20	"
The acetic ether,	1248·52	"
Making,	15,684·35	"

But it is required to weigh 20,473·125 grains, and this weight is to be made up with water. Therefore, 20,473 grains less 15,684 grains gives 4789 grains as the quantity of water required to complete the weight and finish the process.

Leaving the completed illustration now, and resuming the

formula: Take a tared bottle of sufficient capacity to hold the finished preparation, and having weighed into it in succession the remainder of the alcohol required, the purified chloroform and the acetic ether, shake them together and then add the opium solution. Then set the bottle on a scale, and having carefully adjusted the weights to the required complete quantity, add water until this quantity be made up, and shake the mixture. Upon first adding the water the mixture becomes cloudy and suffers contraction and consequent rise of temperature, and if measured now, to control the weighing, the measure will be found plus. But after standing over night, the measure should be found pretty nearly accurate, if the measures used be good. The French litre and half-litre flasks, and a pipette graduated upward in cubic centimetres to 30 or 50 cubic centimetres, are not only extremely useful in this process, but also for many uses, and particularly for testing the accuracy of graduated measures.

When the completed preparation is well shaken, the cloudiness disappears, and it gives a clear bright solution of a deep brownish or yellowish garnet color, and having a rather oily fluidity as it drains down the sides of a glass vessel. The taste is sweet, pleasantly aromatic and somewhat pungent at first, but soon passes to a peculiar, not intense bitterness—the bitterness being that of other opium preparations, but less intense, less disagreeable, and less persistent, and comparatively if not wholly free from the nauseous quality of the opium bitterness. The odor is a refreshing agreeable admixture of the acetous pungency of the acetic ether and the sweet pungency of the chloroform, and recalls that of the vinaigrette smelling-bottle used as a restorative by the ladies. It is miscible in all proportions with alcohol, water, wine, syrup, etc., and is thus well-adapted to compounding in prescriptions. It is perhaps best given in water, the quantity of water being varied at pleasure, but generally limited to the smallest convenient quantity—say, a teaspoonful or a tablespoonful of ice water to each dose. When first mixed with water the mixture is cloudy, but this cloudiness is only momentary.

The dilution, and the irritant action of the chloroform, acetic ether, and the large proportion of alcohol, interfere materially with its application by hypodermic injection. The old liquor

opii compositus was badly adapted to this mode of administration, but was still often so used. This new formula is, however, much less applicable to use in this way. It may, however, be rendered applicable in precisely the same way not unfrequently adopted with the old preparation, namely: by exposing a weighed small quantity at a time, in a shallow vessel in a warm place, until the weight is reduced to one-half or one-third. If reduced to one-third, it will be about the strength of the solution of sulphate of morphia called Magendie's solution; but it will then have too little alcohol to keep longer than a few weeks. If reduced to one-half, the chloroform and acetic ether and much of the alcohol will pass off sufficiently, and yet leave enough alcohol to preserve it. If the alcohol be all or nearly all driven off, the effect of very dilute solutions of phenol, or the so-called carbolic acid, in protecting solutions for hypodermic use from change, may be resorted to. All solutions for such use should be perfectly clear and bright, either by settling or by filtration, and should be carefully guarded against decomposition, since many of the accidents which occur in hypodermic medication are probably caused by the introduction of liquids which are undergoing change, or by inoculation from a badly kept or imperfectly cleaned syringe point.

The compound solution of opium evaporated on a water bath to one-fourth its weight or less, then diluted to one-third its original weight with water, and, when cold, filtered, will give the best solution for hypodermic use. But the coloring and extractive matter is objectionable for this use. If such a solution is to be kept even for a few days (and no hypodermic solution should ever be kept long), it may be protected by the addition of about one-fiftieth of its weight of an alcoholic solution of phenol (crystallized carbolic acid) containing two per cent.

In conclusion, it may be remarked in connection with this liquor opii compositus, as in regard to other agents which are liable to become hobbies, that perhaps the greatest skill in using it is to know when to prefer something else.

Brooklyn, Dec. 15, 1869.